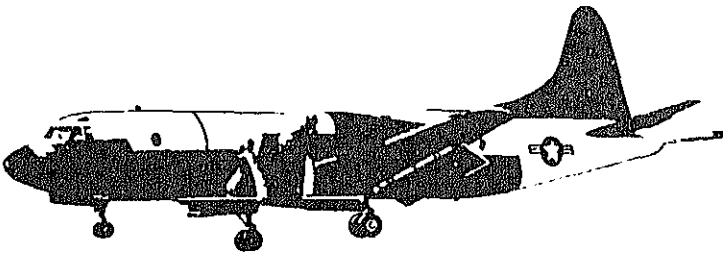
TRAINEE WORKBOOK

FOR

ANCED FIRST TERM AVIONICS CO

CLASS A1

C-100-2010



UNIT 9

TACAN

CNTT-M529 Rev. 6-81

PREPARED BY

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PREPARED FOR

NAVAL TECHNICAL TRAINING COMMAND

basics of modern rapid reading consist of five points. F
you will soon read at a swift pace and still understand
you read:

PRE-READ: Before you start an article, note the headline
ures and captions -- everything that will help you size u
before you start. Then read the first two or three parag
y and look over the opening sentences of the next several
Note the conclusion of the article. Now you know enough
want to read it.

ADJUST YOUR SPEED: It's as silly to read everything at t
it would be always to drive your car at 40 mph. From yo
you can usually gauge the difficulty of the material. H
les of thumb on reading speeds:

information only: Go fast, but don't miss the point.

valuate ideas: Go slower, because you are asking questio
.

self-enrichment: Even slower, because you want to catch
meaning.

READ IN PHRASES: Normally, you read with a series of qu
s, seeing words only when your eyes are stopped. You can
ding by increasing the number of words you see at each st
phrases instead of single words. You should read / this
swift takes.

CONCENTRATE: If you don't, you will get nothing out of y
speed. There are two tricks: First, give yourself a goo
ent -- good light, no glare; a comfortable but not too co
reedom from noise and other outside distraction. Second,
acting emotional problems. If you are worried, try to do
, even it it's no more than making a phone call or writin
That way, you will clear your mind for action.

REMEMBER: The purpose of reading swiftly is to get more
ding. The hazard is reading without remembering. Here a
hat will help you retain what you read:

arize as you go: At first, you can even write down a brie
two or three paragraphs; soon you will learn to do it me
vast motion.

questions: As you read, you can anticipate what's coming
. This will help keep you focused on the target.

the radio range system.
State what information is provided by the tacan sys
provided by other air navigational systems presente
gram.
Match a given list of frequencies with the appropri
tional aid.
List the two major units of a tacan system.
State the number of channels in a tacan system.
List the transmit and receive frequencies of the te
transceiver and the surface transceiver.
List the two types of modulation and their major us
system.
State the pulse width and pulse spacing of a stande
pair.
State the frequency, in Hz, of the identification (
and the interval which it is transmitted from the s
ceiver.
State the prf of the tacan airborne transmitter in
track conditions.

CIFIC OBJECTIVES:

State the type and electrical length of the antenna used
tacan surface station.

State the purpose of rotating one parasitic reflector ar
antenna at 900 rpm.

State the purpose of rotating the directors around the a
900 rpm.

State the frequency of the main reference burst in cycle
second.

State the number and spacing of pulse-pairs in the m air
burst.

List the two components of the transmitted signal which
to establish the approximate bearing.

State the frequency of the auxiliary reference burst in
second.

State when the auxiliary reference burst is transmitted

List the number and spacing of the pulse pairs in the a
reference burst.

List the two components of the transmitted signal used
azimuth accuracy of plus or minus two-ninths (2/9) of a

State the purpose of the random or squitter pulse-pairs

State the pulse pair recurrence rate of the identificat
signal.

State the spacing of the pulse pairs of the identificat

State when a tacan surface station will transmit range

State the total number of pulse-pairs per second (pps)
by a tacan surface station.

List, in proper sequence, the pulse groups transmitted
surface station.

PECIFIC OBJECTIVES:

. State the information a pilot receives from the ta
. State the purpose of the antenna reflector.
. State the point, in reference to magnetic North, t
reference burst is transmitted.
. State the purpose of the antenna directors.
. State the number of auxiliary reference bursts for
reflector revolution.
. State the characteristic of a main reference burst
. State the characteristics of an auxiliary referenc
. Describe the composite video waveform of one anten
transmitted by the ground station.
. Describe a tacan pulse pair.
. List the tacan modes of operation.
. State the information and priority transmitted by
station.
. State the tacan transceiver transmit and receive f
. Demonstrate the ability to operate the test equipm
a tacan system.
. Demonstrate the ability to perform an operational
system.
. Recognize the signal transmitted by the simulator
. Record the layout of the modules on the chassis.
. Determine tacan bearing by observing output wavefo
simulator.
. Recognize the different types of signal contained
waveform.

for range and bearing information.

C. SPECIFIC OBJECTIVES:

1. State the general purpose of the
   (a) R-F module
   (b) Range decoder module
   (c) Range A module
   (d) Range B module
   (e) Magnetic amplifier module
   (f) Range mechanical module
   (g) Bearing decoder module
   (h) Bearing A module
   (i) Bearing B module
   (j) Bearing mechanical module
   (k) Air-to-air module
   (l) Antenna selector module
2. Analyze the ranging system simplified block diag
3. Analyze the bearing subsystem simplified block d

LESSON NO. T5.2.5

A. TITLE: RANGE DECODER MODULE

B. PURPOSE: To provide an understanding of the theory
the range decoder module.

C. SPECIFIC OBJECTIVES:

1. State the purpose of the range decoder.
2. Name the five major sections of the range decode
3. Describe the types of circuits used in the range
4. Describe the inputs and outputs of the circuits
decoder module.
5. State the purpose of the different sections.
6. State where the different outputs of the section

State the purpose of the range A module.
List the outputs from the range A module.
Analyze the operation of the range A module, using the b
gram.
Describe the operation of the countdown multivibrator.
Describe the operation of the integrator control R-S fli
Describe the operation of the coarse range integrator.
Describe the operation of the 190 μsec one shot multivit
Describe the operation of the pulse former and fine rang
generator.
Describe the operation of the early gate former.
Describe the operation of the late gate former.
Describe the operation of the selector NAND gate.
Describe the operation of the reply pulse multivibrator.
Describe the operation of the coincidence circuits.

O. T5.3.7

E: RANGE B MODULE ANALYSIS
OSE: To develop an understanding of the purpose and ope
a typical tacan range B module.
IFIC OBJECTIVES:
State the purpose of the range B module.
Describe the operation of the control relays in late coi
track mode.
Describe the operation of the control relays in search m
Describe the operation of the control relays in track mo
Describe the operation of the control relays in memory.
Describe the transition from search to track.
Analyze the operation of the early and late coincidence
Analyze the operation of the magnetic amplifier control
Analyze the operation of the late coincidence track rele
circuits.
Analyze the operation of the track relay control circuit
Analyze the operation of the memory circuits.

O. T5.3.8

E: PROGRESS TEST AND REVIEW
OSE: To determine your progress this week and need for
instruction.
IFIC OBJECTIVES:
Complete examination.
Participate in review.

CIFIC OBJECTIVES:
State the purpose of the antenna selector module.
Describe the two inputs that control the antenna selecto
Analyze the operation of the antenna selector module whe
is no input present.
Analyze the operation of the antenna selector module whe
the two inputs is present.

NO. T5.3.10

LE: TACAN POWER SUPPLIES
POSE: To develop an understanding of a typical tacan powe
CIFIC OBJECTIVES:
State the purpose of the
a. 1A1A15 power supply module
b. 1A1A9 power supply module
c. 1A3 inverter
List the a-c outputs from the 1A1A15 moduel.
Describe the operation of the series regulator magnetic a
(T802).
List the d-c outputs from the 1A1A15 module.
Describe the operation of the +120 vdc supply and regulat
Describe the operation of the -108 vdc supply and regulat
Describe the operation of the 90 second delay circuit.
List the outputs of the 1A1A9 module.
Describe the operation of the +28 vdc circuits.
Describe the operation of the +15 vdc supply and regulato
Describe the operation of the -15 vdc supply and regulato

NO. T5.3.11

LE: BEARING DECODER MODULE
POSE: To develop an understanding of the operation of the
decoder module, through block diagram and circuit a
CIFIC OBJECTIVES:
State the purpose of the bearing decoder.
Describe the circuits used to detect the amplitude modula
Describe the circuits used to detect the North burst.
Describe the circuits used to detect the auxiliary refere
Analyze the operation of the circuits used to detect the
modulation.
Analyze the operation of the circuits used to detect the
burst.
Analyze the operation of the circuits used to detect the
reference burst.

7. Describe the operation of the 15 Hz phase comp
8. State the different modes of operation.
9. Describe the operation of the 15 Hz phase comp
10. State the conditions required to change from l track.
11. State the conditions required to change from l track.
12. Describe the TACH feedback used in search and

ESSON NO. T5.3.13

TITLE: TROUBLESHOOTING A TACAN UNIT
PURPOSE: To become proficient in the practical an shooting of a tacan.
SPECIFIC OBJECTIVES:
1. Observe safety precautions.
2. Troubleshoot the range circuits.
3. Troubleshoot the bearing circuits.

ESSON NO. T5.3.14

TITLE: R-F MODULE ANALYSIS
PURPOSE: To provide a better understanding of the circuitry used in the r-f module.
SPECIFIC OBJECTIVES:
1. State the purpose of the channel servo circuit
2. State the purpose of the frequency multipliers
3. State the purpose of the transmitter preselect
4. State the purpose of the I-F amplifiers.
5. State the purpose of the modulator.
6. Describe how tacan pulse pairs are generated.
7. Describe how A/A reply pulses are generated.
8. Describe the operation of the suppression circ
9. Describe the operation of the AGC circuits.
10. State the purpose of the A/A storage counter.
11. Describe the operation of the transmitter prot
12. State the purpose of the A/A priority circuits

system.

ECIFIC OBJECTIVES:

Complete performance test following procedure outline sheet.

Record required information on data sheet.

NO. T5.3.16

TLE: AIR-TO-AIR MODULE ANALYSIS

RPOSE: To develop a basic understanding of a typical t air system.

ECIFIC OBJECTIVES:

State the purpose of the air-to-air module.

Analyze the received interrogation signal.

Describe the operation of the delay multivibrator.

Describe the operation of the reply pulse generator.

List the modules affected by air-to-air operation.

Describe the effects on these modules when operating to-air mode of operation.

NO. T5.3.17

TLE: PHASE EXAMINATION

RPOSE: To determine your progress in this unit and pre of this phase.

ECIFIC OBJECTIVES:

To complete an objective-type examination for the pur termining understanding of the phase material.

Reading assignment: Introduction to a Tacan surface s
CNATT M205 PAT

Answer the following questions:

1. The surface beacon station operates at a constant
approximately
   a. 3600 pps.
   b. 2700 pps.
   c. 120 to 150 pps.
   d. 22 to 30 pps.

2. The main reference burst is transmitted when the m
   a. magnetic east.
   b. magnetic north.
   c. true north.
   d. true east.

3. The spacing between pulse pairs in the main refere
   a. 30 µsec.
   b. 12 µsec.
   c. 8 µsec.
   d. 24 µsec.

4. The pulse pair spacing of the auxiliary reference
   a. 30 µsec.
   b. 12 µsec
   c. 8 µsec.
   d. 24 µsec.

5. How many pulse pairs are in the main reference bur
   a. 22 to 30.
   b. 120 to 150.
   c. 8.
   d. 12.

6. The auxiliary reference burst is transmitted every
after the main reference burst.
   a. 40.
   b. 90.
   c. 50.
   d. 270.

d. 15.

The main reference burst is transmitted
a. 900 per minute.
b. 199 per minute.
c. 120 to 150 per minute.
d. 22 to 30 per second.

In the Tacan system, the identification signal is transm
a. 75 μsec.
b. 37.5 μsec.
c. 40°.
d. 562.5 revolutions of the antenna.

The specing of the pulses in a pulse pair is
a. 12 μsec.
b. 3 1/2 μsec.
c. 24 μsec.
d. .00012 msec.

The pulse width of a pulse in a pulse pair is
a. 3 1/2 μsec @ 1/2 power points.
b. 3 1/2 μsec.
c. 12 μsec @ 1/2 power points.
d. 12 μsec.

Of the 3600 pps transmitted, how many are used for azimut
a. 2700.
b. 180.
c. 900.
d. 195.

How many parasitic elements are used to produce the 135 l
bearing signal?
a. 1.
b. 8.
c. 15.
d. 9.

The surface beacon station uses what type of modulation?
a. A-M and F-M.
b. Pulse and r-f.
c. Pulse and amplitude.
d. Amplitude and r-f.

The surface beacon station can supply range informatio
many aircraft simultaneously?
a. 195.
b. 299.
c. 3600.
d. 100.

What is the frequency of the ID pulses transmitted by
station?
a. 135 Hz.
b. 1350 Hz.
c. 2700 Hz.
d. 3600 Hz.

E: TEST EQUIPMENT

Preliminary setup procedures

1. Oscilloscope (453/R453) - Turn the POWER switch ON.

2. Beacon Simulator (ARM-22A)
   a. Ensure the antenna is connected from J-704 on sig
      to the antenna jack on the 8H7 trainer.
   b. Turn the AC and DC POWER switches on the power sup
   c. Turn the AC switch on the signal generator to ON.

3. 8H7 Tacan Trainer
   a. Ensure that no modules are missing.
   b. Turn the POWER switch on the indicator panel to ON

Operational procedure for Type 453/R453 oscilloscope

1. TURN-ON procedure
   a. Cathode ray tube controls
      (1) INTENSITY: fully CCW.
      (2) FOCUS: midrange.
      (3) SCALE: fully CCW.
   b. Vertical controls (both A and B channels)
      (1) VOLTS/DIV: 20 mv.
      (2) VARIABLE: CAL.
      (3) POSITION: midrange.
      (4) INPUT COUPLING: DC.
      (5) MODE: channel 1
      (6) TRIGGER: NORM.
      (7) INVERT: pushed in.
   c. Triggering controls (both A and B channels)
      (1) LEVEL: CW (+).
      (2) SLOPE: +.
      (3) COUPLING: AC
      (4) SOURCE: INT.
   d. Sweep controls
      (1) DELAY TIME MULTIPLIER: fully CCW.
      (2) A & B TIME/DIV: .5 ms.
      (3) A VARIABLE: CAL.
      (4) B SWEEP MODE: B STARTS AFTER DELAY TIME.
      (5) HORIZ DISPLAY: A
      (6) MAG: OFF.
      (7) POSITION: midrange.
      (8) A SWEEP LENGTH: FULL.
      (9) A SWEEP MODE: AUTO TRIGGER.
   e. Side panel controls
      (1) B TIME/DIV VARIABLE: CAL.
      (2) CALIBRATOR: .1 volts.

Adjust CH 1 vertical POSITION control until the trace
with the lowest horizontal graticule line.
Connect the 1 kHz CAL connector to the CH 1 input conne
with a BNC cable.
Turn the A LEVEL control toward 0, until the display be
stable.
Check the time of one cycle of the observed signal to
millisecond. (2 squares times .5 ms = 1 ms)
Check the amplitude of the observed signal to be .1 vol
(5 squares times 20 mv = .1 volt)
Repeat steps e through i for channel 2, with the mode
set to the channel 2 position.
Disconnect the BNC cable and place it in the drawer.

up for waveform analysis (CH 1 and CH 2 when appropriate
MODE: CH 1 or CH 2.
VOLT/DIV: as required.
INPUT COUPLING: AC.
A & B TIME/DIV: as required.
SOURCE: EXT divided by 10.
A SWEEP MODE: NORM TRIG.
Sync input from J-5 on PULSE GENERATOR or SUPPRESSION
J-2 on trainer.
This procedure is used when taking waveforms.

up for voltage readings (DC) (CH 1 and CH 2 when requir
MODE: CH 1 or CH 2.
VOLT/DIV: as required.
INPUT COUPLING: DC.
Center sweep on scope.
Apply signal to scope.
Sweep displacement gives DC level of signal,
This procedure is used when taking DC readings only.

BY and SECURE procedure
STAND-BY: Turn the INTENSITY control fully CCW.
SECURE: Turn the INTENSITY control fully CCW, and tur
POWER switch to the OFF position.
Only complete these steps or step when instructed to do
instructor.

ional procedures for beacon simulator (ARM-22A)

ntrol settings
Place the DIAL DRIVE CW/OFF/CCW switch in the OFF posi
Place the BEARING MOTOR/OFF switch in the BEARING MOTO

Place the NORTH BURST/OFF switch to the NORTH BURST posit
Place the AUX BURST/OFF switch to the AUX BURST position.
Place the PULSE OUTPUT SELECTOR switch in the SQUITTER po
Set the 15 cycle PHASE SHIFT control to 0°.
Set the SPACING control switch to the 12 (microsecond) po
Set the 15 cycle AMP ADJ control fully CCW.
Set the 135 cycle AMP ADJ control fully CCW.
Set the BEARING DIAL to read 270°.
Place the SYNC SELECTOR switch to the 15 cycle position.
Set the BEARING RATE control fully CCW.
Set the RANGE RATE control fully CCW.
Set the VARIABLE RANGE CONTROL to fully CCW. (zero)
Place the RANGE switch in the FIXED position.
Set the FIXED RANGE switch to 0 miles.
Set the EFFICIENCY switch to 85%.

ıtrol adjustments
Set the ARN/21 POWER control to fully CW.
Place the NORMAL/A/A switch in NORMAL position.
Place the FUNCTION SELECTOR switch in the ZERO position.
Press the PUSH-TO-SET button.
Turn the ZERO SET control to adjust meter to zero.
Release the PUSH-TO-SET button.
Place the FUNCTION SELECTOR switch in the SG POWER CALIBI
position.
Press the PUSH-TO-SET button.
Adjust SG POWER CALIBRATOR control to adjust POWER LEVEL
to the SET position.
Release the PUSH-TO-SET button.
Set the channel selector to channel 63.
Place the MOD/UNMOD switch to the UNMOD position.
Place the FUNCTION SELECTOR switch in the PULSE OUT posit
Press the PUSH-TO-SET button.
Press in and adjust the RF TRIM control for a peak on the
LEVEL meter.
Adjust the OUTPUT SET control until the POWER LEVEL meter
SET.
Release the PUSH-TO-SET button.
Repeat steps c through q and then continue with step r.
Place the MOD/UNMOD switch to the MOD position.
Steps c through r should be repeated every 15 minutes.
Set the RF LEVEL DBM dial to -50 dbm.
Steps c through r should also be repeated if any channel c
that that is made.

ɔcedure for setting modulation levels
If modulation levels are not required to be adjusted, set
cycle and 135 cycle amplitude controls to the 20% mark on
simulator, and complete steps h and j.

scope to the PULSE OUTPUT jack J-7 on the PUL
unit of the ARM-22A.

b. Modulation adjustments
   (1) Set the PULSE OUTPUT POS/NEG switch to the PO
   (2) Turn the AMPLITUDE control CW until the wavef
   peak-to-peak.
   (3) Set the VOLT/DIV switch on the oscilloscope t
   (4) Set the vertical poition so that the top of t
   is at the center grid line.
   (5) Set the 15 cycle-OFF-REV switch to the 15 cyc
   (6) Adjust the 15 cycle AMPLITUDE control to obta
   peak-to-peak signal on the oscilloscope.
   (7) Turn the 15 cycle-OFF-REV switch to the OFF p
   (8) Set the 135 cycle-OFF-REV switch to the 135 c
   (9) Adjust the 135 cycle AMPLITUDE control to obt
   peak-to-peak signal on the oscilloscope.
   (10) Set the 15 cycle-OFF-REV switch to the 15 cyc

OTE: Do not turn these controls after this step has bee
Any change in the amplitude settings will require
setup of the modulation levels.

. STANDBY & TURN OFF procedure
   a. STANDBY - gear on (no change).
   b. TURN OFF - place the AC and DC power switches to
   tion, on the power supply and signal g
   units. (Only complete this step if ins
   do so by an instructor.)

perational check for a tacan system

. Tacan control panel functions
   a. ID-388 is distance (NAUTICAL MILES) indicator.
   b. ID-250A is course indicator.
   c. Radio set control
      (1) MODE switch
         (a) OFF position, equipment inoperative.
         (b) REC position, azimuth and ID information.
         (c) T/R position, azimuth, ID, and range info
         (d) A/A position, range only.
      (2) CHANNEL SELECTOR switch - four position switc
      (3) Volume control - a potentiometer which taps o
      amount of audio to the pilot's headphones.

. TURN-ON procedure
   a. Set the CHANNEL SELECTOR controls to channel 63.
   b. Set the MODE SELECTOR switch to the REC position.
   c. Allow approximately 90 seconds for the equipment

(1) Connect an oscilloscope probe from CH 1 input on t
loscope to J1-3 (1A1A1) on the TACAN.
(2) Adjust the A SWEEP LENGTH control CCW until the sw
eight divisions in length.
(3) With the A&B TIME DIV set on 5 msec, set the A Var
control so that one cycle of 15 Hz is observed.

One composite waveform should be observed on the scope.
The observed waveform should contain one MRB, eitht ARE
squitter pulses, and be amplitude modulated by 15 and 1
If the waveform cannot be observed, recheck your work a
consult an instructor.

Azimuth accuracy and tracking

The azimuth indicator ID-250A should indicate a bearing
to the simulated station.

(1) Place the DIAL DRIVE switch in the CW position.
(2) Turn the BEARING RATE control slowly CW to the nin
sion.

This simulates the azimuth changing at 20° per second,
its minimum performance standard for azimuth tracking.
The bearing indicator should track the changing bearing
the indicator breaks lock-on and starts searching CCW,
muth does not meet the minimum performance check.

(3) Place the DIAL DRIVE switch in the CCW position.
(4) Repeat the check for CCW rotation.
(5) Set the BEARING RATE control fully CCW.
(6) Place the DIAL DRIVE switch to the OFF position.
(7) Set the BEARING DIAL to 270°.

Range accuracy and tracking

(1) Set the TACAN mode selector switch to the T/R posi

The range indicator ID-388 should search and lock-on tc
range selected.

(2) Set the FIXED RANGE control to 54 (NAUTICAL MILES)

The range indicator ID-388 should search and lock-on tc
(NAUTICAL MILES).

(3) Place the RANGE switch in the RATE 50 to 100 posit
(4) Allow the range indicator to lock-on to a range be
and 100.
(5) Turn the RANGE RATE control CW five divisions.

The range indicator should track in and out between 50
(NAUTICAL MILES). This simulates the range at 2500 NAU
MILES PER HOUR. If the range does not stay locked on,
does not meet the range tracking minimum performance st

(6) Set the RANGE RATE control fully CCW.
(7) Place the RANGE switch in the FIXED position.
(8) Set the FIXED RANGE CONTROL to the 0 position.
(9) Set the TACAN MODE SELECTOR switch to the REC posi

ID tone test

(1) Plug headset into AUDIO IDENTITY jack on the CONTR

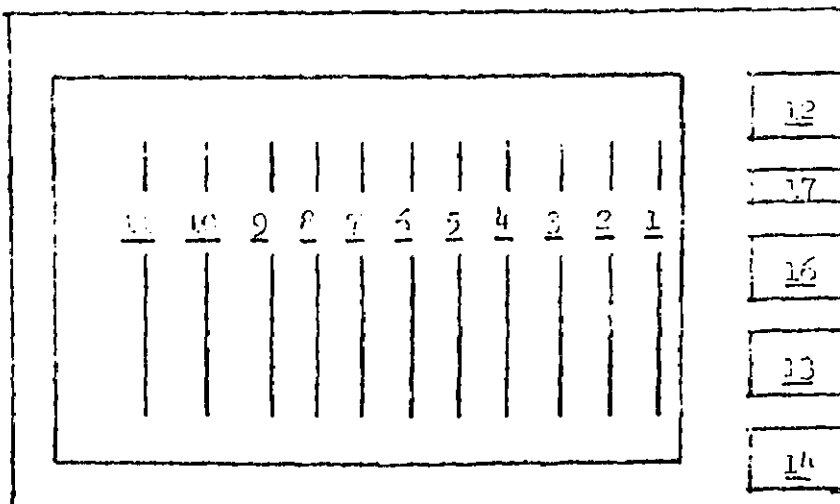
Place the NORMAL A/A switch to the A/A position.
Set the TACAN MODE SELECTOR switch to the A/A position.
ange indicator should lock-on to the FIXED RANGE selecte
Place the PULSE OUTPUT SELECTOR switch to the SQUITTER
osition.
Place the NORMAL A/A switch to the NORMAL position.
Set the TACAN MODE SELECTOR switch to the T/R position.
ver sensitivity
Set the RF LEVEL DBM dial to -80 DBM.
Set the FUNCTION SELECTOR switch to the CW OUT position.
hen the TACAN breaks azimuth and range lock-on, return
FUNCTION SELECTOR switch to the PULSE OUT position.
ACAN range and azimuth should lock on. If the TACAN loc
en it meets the minimum receiver sensitivity check. If
or/and azimuth does not lock on then the TACAN does not
inimum receiver sensitivity standard.
Return the RF LEVEL DBM dial to -50 DBM.
smitter peak power
Place the FUNCTION SELECTOR switch in the ARN/21 POWER p
tion.
Ensure that the ARN/21 POWER control is fully CW.
Press the PUSH to SET button and turn the ARN/21 POWER c
trol CCW until the POWER LEVEL meter reads on the red li
Read the peak power output of the TACAN from the ARN/21
POWER control.

DATA SHEET NO. T5.3.3

ITLE: INTRODUCTION TO A TACAN SYSTEM

. Location of equipment parts and subassemblies - I
blies and parts below by name and number.

	NAME	
(1)	_____	1A1A _____
(2)	_____	1A1A _____
(3)	_____	1A1A _____
(4)	_____	1A1A _____
(5)	_____	1A1A _____
(6)	_____	1A1A _____
(7)	_____	1A1A _____
(8)	_____	1A1A _____
(9)	_____	1A1A _____
(10)	_____	1A1A _____
(11)	_____	_____
(12)	_____	1A1A _____
(13)	_____	1A1A _____
(14)	_____	1A1A _____
(15)	_____	1A1A _____
(16)	_____	1A1A _____
(17)	_____	_____
(18)	_____	J-_____
(19)	_____	J-_____
(20)	_____	J-_____
(21)	_____	J-_____
(22)	_____	J-_____

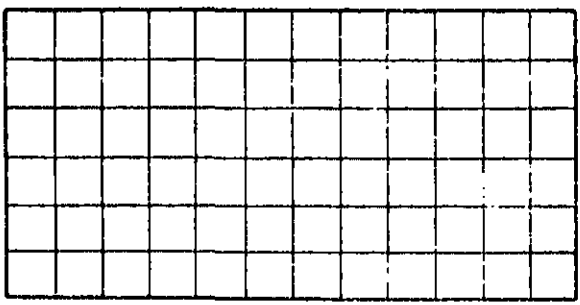


ID tone	( )	( )
Air-to-air simulation	( )	( )
Receiver sensitivity	( )	( )
Transmitter peak power	( )	( )

iver waveform analysis

Test Point J1-3 (1A1A1) with the azimuth indicators point
270°.

I/F



(1) Describe the observed waveform composition.

(a) _____

(b) _____

(c) _____

(d) _____

(e) _____

(f) _____

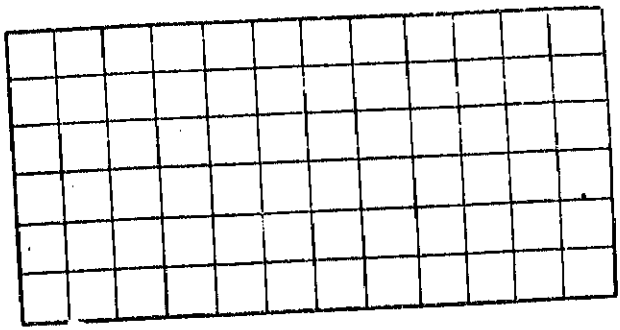
(2) The peak of the observed signal, in relationship to t
is

LEADING/LAGGINB by _____ degrees, because (SELE

CORRECT STATEMENT/S).

a) The aircraft's position is 270° from the simulated
b) Maximum power is directed toward 090° when the MRB
transmitted.
c) The aircraft's position is magnetic East of the sim
station.
(d) The MRB and peak power are always transmitted at t
time.

Point J1-3 (1A1A1) with the azimuth indicator pointin

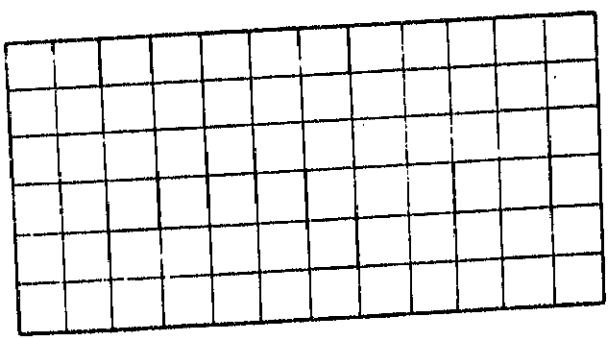


) The peak of the observed signal, in relationship to
is LEADING/LAGGING by _____ degrees.

) The simulated aircraft's position is magnetic _____
the station.

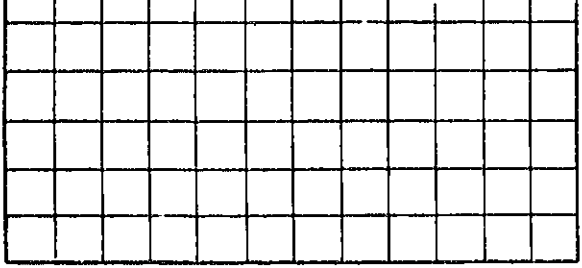
est Point J1-3 (1A1A1) with the azimuth indicator point

/F



(1) The peak of the observed signal, in relationship to
degrees.

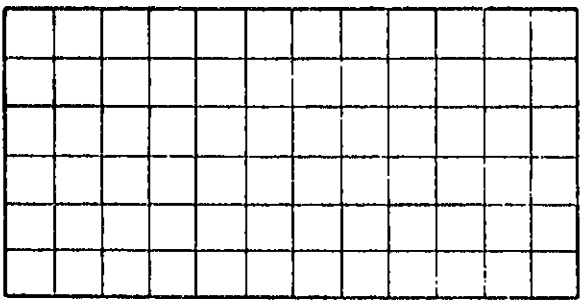
W/F



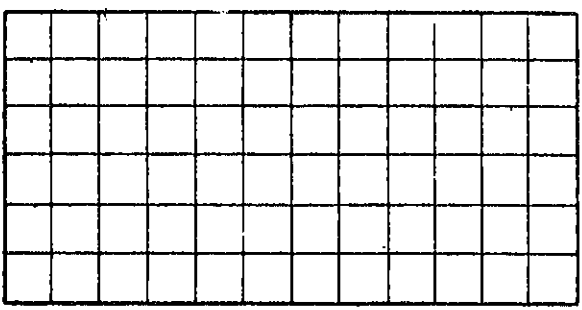
(1) The peak of the observed signal, in relationship to
LEADING/LAGGING by _____ degrees.

(2) The simulated aircraft's position is magnetic _____
the station.

osite waveform analysis
MAIN Reference Burst with probe at J1-3 (1A1A1)



Auziliary Reference Burst with probe at J1-3 (1A1A1)



: INTRODUCTION TO A TACAN UNIT

nswer the following questions:

. What types of information are available by the use

a. Range and Azimuth.
b. Azimuth and ID, sometimes range.
c. Range, Azimuth, ID.
d. MRB, ARB, Range, ID, and squitter pulses.

. The frequency range of the transmitter is

a. 962 to 1024 MHz.
b. 1025 to 1150 MHz.
c. 1151 to 1213 MHz.
d. 1025 to 1150 MHz.

. The frequency range of the receiver is

a. 962 to 1024 MHz and 1151 to 1213 MHz.
b. 962 to 1213 MHz.
c. 962 to 1108 MHz and 1109 to 1213 MHz.
d. 1025 to 1150 MHz.

. How many channels are available in the Tacan transc

a. 135.
b. 126.
c. 120.
d. 4.

How many crystals are used to make these channels a

a. 15.
b. 136.
c. 126.
d. 115.

In order to display range and azimuth, the FUNCTION switch must be in the

a. OFF position.
b. REC position.

of the Tacan system is

d. 2000 watts.

9. The bearing accuracy of the Tacan is
   a. $\pm$ 2/9°.
   b. $\pm$ 5.0°.
   c. $\pm$ 0.5°.
   d. $\pm$ 9/2°.

10. The minimum receiver sensitivity is
   a. -80 dbv.
   b. -80 dbm.
   c. -82 dbv.
   d. -82 dbm.

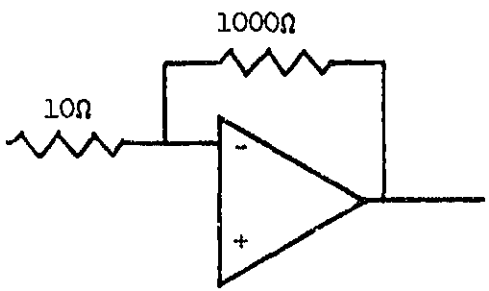
11. The warm-up time of the Tacan is
   a. 24 sec.
   b. 60 sec.
   c. 120 sec.
   d. 90 sec.

12. The range accuracy is
   a. $\pm$ 2/9 miles.
   b. $\pm$ 0.5 miles.
   c. $\pm$ 5.0 miles.
   d. $\pm$ 9/2 miles.

13. The Tacan is operating on channel 56
   a. The airborne transmitter frequency is.. _____
   b. The airborne receiver frequency is..... _____
   c. The beacon transmitter frequency is.... _____
   d. The beacon receiver frequency is..... _____

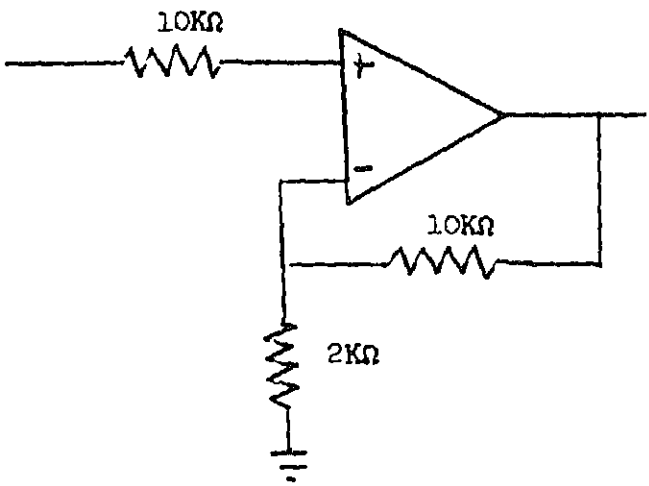
14. Determine the value required in the following Ic'

   a.

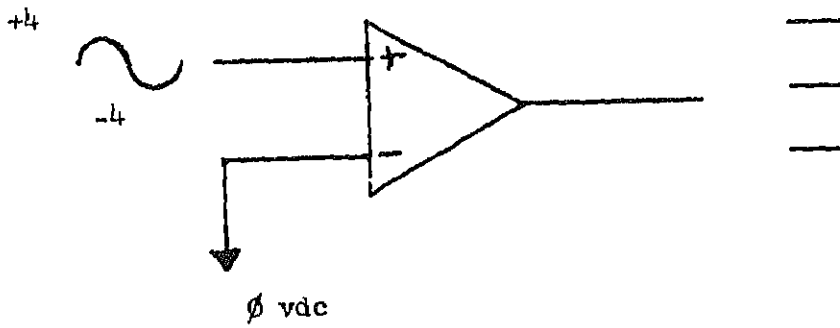


gain = _____

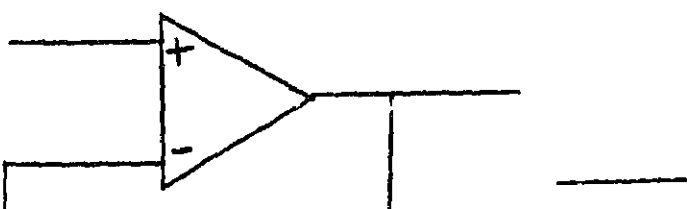
b.



c. Draw output signal



d. What type of circuit



ated circuits used in device 8H7 are listed in figure 1, onal description follows on each IC.

	P/N	Function
	709	Operational Amplifier, Comparator
		Multivibrator, Oscillator
	715	Operational Amplifier
	711	Integrator, Bandpass Filter, Op Ar
rner	946	NAND GATE
	MC1469R	Voltage Regulator

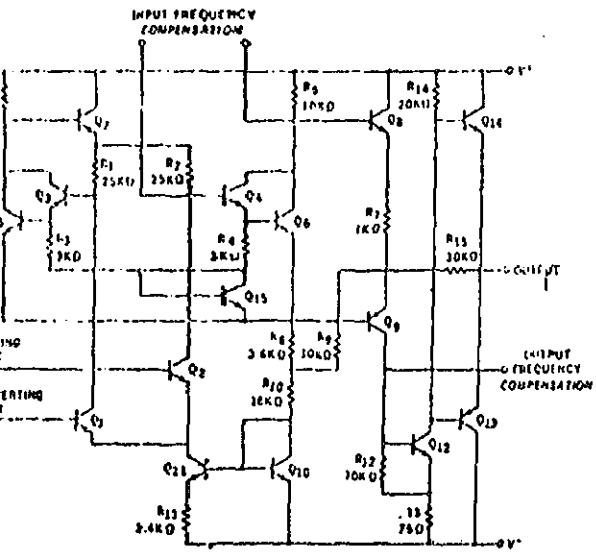
Figure 1

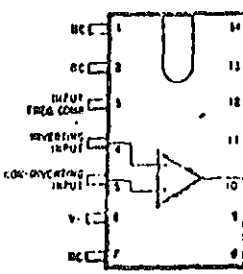
erformance Operational Amplifier 709C. The 709C is a hi onal amplifier constructed on a single silicon chip usi Epitaxial Process. It features low offset, high input large input common mode range, high output swing under l ver consumption. The 709C displays exceptional temperatu and operates over a wide range of supply voltages with ation of performance. The amplifier is intended for use ystems, high impedance analog computers, in low-level i applications and for the generation of special linear a transfer functions. Figure 2 lists the absolute maximu amplifier and figure 3 illustrates the schematic and co of the 709C.

eed Operational Amplifier 715. The 715 is a high speed nolithic operational amplifier constructed on a single s ing the epitaxial process. The 715 features fast settli ew rate, low offsets, and high output swing for large si tions. The device also displays excellent temperature s rates over a wide range of supply voltages. The 715 is in A-to-D and D-to-A converters, active filters, defle ers, video amplifiers, phase locked loops, multiplexed precision comparators, sample and molds, and general fe tions requiring d-c wide bandwidth operation. Figure olute maximum ratings of the amplifier and figure 5 illu ematic and connection diagrams of the 715.

Parameter	
upply voltage	±18v
nternal power dissipation (for ambient emperatures to +70°C)	250 mw
ifferential input voltage	±5.0v
nput voltage	±10v
utput short circuit duration (T_A = 25°C)	5 sec
torage temperature range TO-99	-65°C
dual-in-line	-55°C
perating temperature range	0°C to
ead temperature TO-99 (Soldering, 60 sec)	300°C
dual-in-line (soldering, 10 sec)	260°C

Figure 2



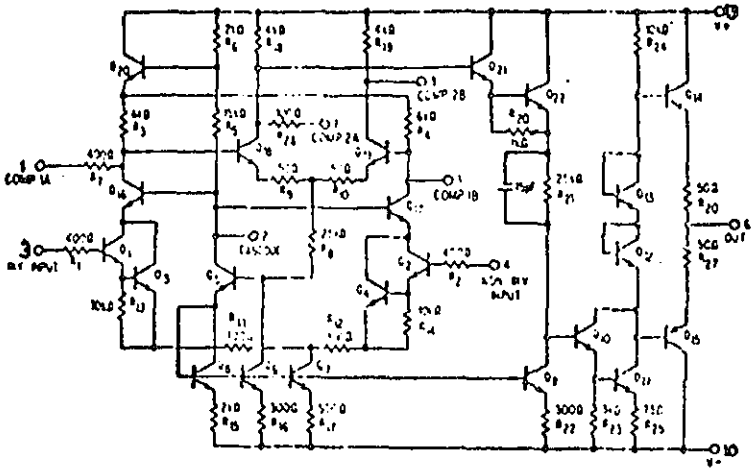


Parameter	Rating
y Voltage	±18V
nal Power Dissipation (for e temperatures to +125°C.)	500mW
rential Input Voltage	±15 V
Voltage	±15 V
ge Temperature Range	-65°C to +150°C
ting Temperature Range	-55°C to +125°C
Temperature (Soldering, 60 onds)	300°C

Figure 4

formance Operational Amplifier 741C. The 741 C is a hig monolithic operational amplifier constructed on a singl chip, using the Planar Epitaxial Process. It is intende ange of analog applications. High common mode voltage r nce of "latch-up" tendencies make the 741C ideal for use e follower. The high gain and wide range of operating v superior performance in integrator summing amplifier, an ack application. The 741C is short circuit protected an o external components for frequency compensation. The i ave roll-off ensures stability in closed loop applicatio lists the absolute maximum ratings of the amplifier and rates the schematic and connection diagrams of the 741C.

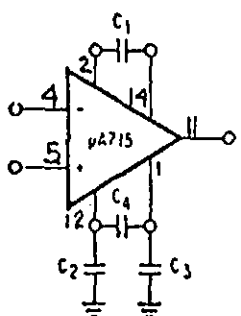
E 946. The 946 is an active low NAND gate composed of OTL gate. The gate has low power, medium speed, and fle use of wired-OR capability. Figure 8 lists the absolute ngs of 946 operation and figure 9 illustrates the 946 sc ic gate circuit), logic symbol and connection diagrams.

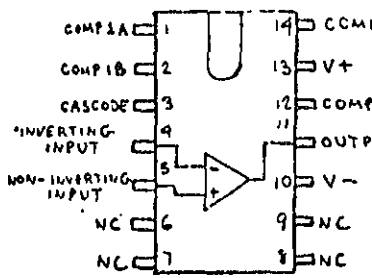


COMPENSATION COMPONENTS VALUES

OSED OP AIN	C_1	C_2	C_3	C_4
000	10 pF	—	—	—
00	50 pF	—	250 pF	—
0	100 pF	—	—	200 pF
	500 pF	2000 pF	1500 pF	—

FREQUENCY COMPENSATION CIRCUIT





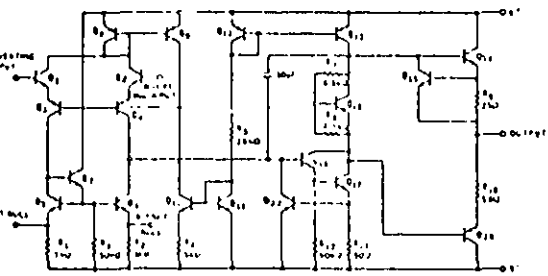
Parameter	R
pply voltage	±18v
ternal power dissipation	500 m
fferential input voltage	±30v
put voltage (see Note 1)	±15v
orage Temperature range TO-99	-65°C
dual-in-line	-55°C
erating temperature range	0°C t
ad temperature (soldering, 60 sec) TO-99	300°C
(soldering, 10 sec) dual-in-line	260°C
tput short circuit duration (see Note 2)	Indef

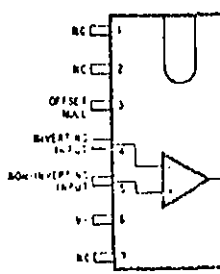
NOTE

For supply voltages of less than ± 15 volts dc, the a
maximum input voltage is equal to the supply voltage.

The short circuit may be to ground or to either suppl

Figure 6



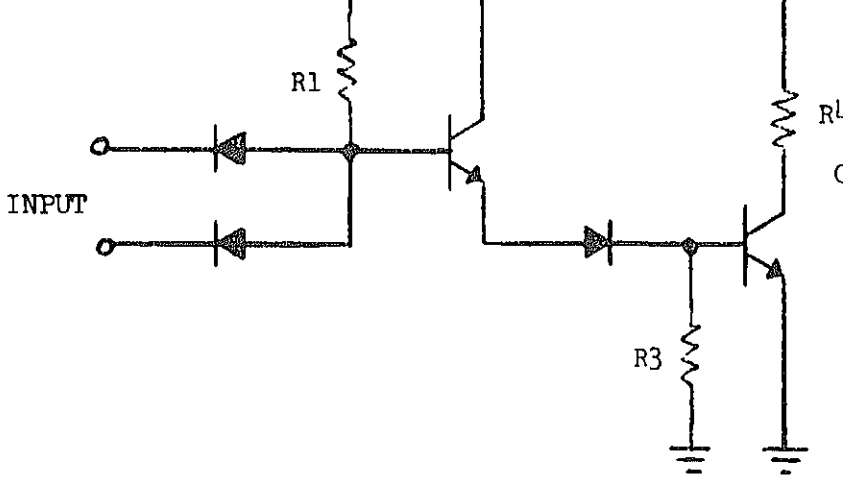


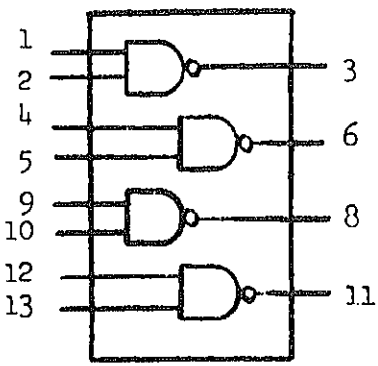
OLTAGE REGULATOR MC1469R. The monolithic voltage regulato
igned to deliver continuous load current to 500 milliamper
ith a maximum input voltage of 40 volts d-c, or load curre
C amperes when current boosted through use of a single ext
ransistor. Stability is maintained by the addition of a C
ompensation capacitor (with or without current boosting).
0 lists the maximum ratings and figure 11 illustrates the
nd connection diagram of the MC 1469R.

ABSOLUTE MAXIMUM RATINGS OF 946

Parameter	Rati
orage temperature	-65°C to
mperature (ambient) under bias	-55°C to
pin potential to ground	-0.5v to
, pulsed 1 second	12v
ut voltage, applied to input	-15v to
ltage applied to output when output is high	$+V_{CC}$
ut current, into inputs	1.0 ma
rrent into output when output is low	
cept 9932 and 9944)	30 ma
rrent into output when output is low	
32 and 9944)	100 ma
d temperature (soldering, 60 seconds)	300°C

Figure 8





PIN 14 = V_{CC}
PIN 7 = GROUND

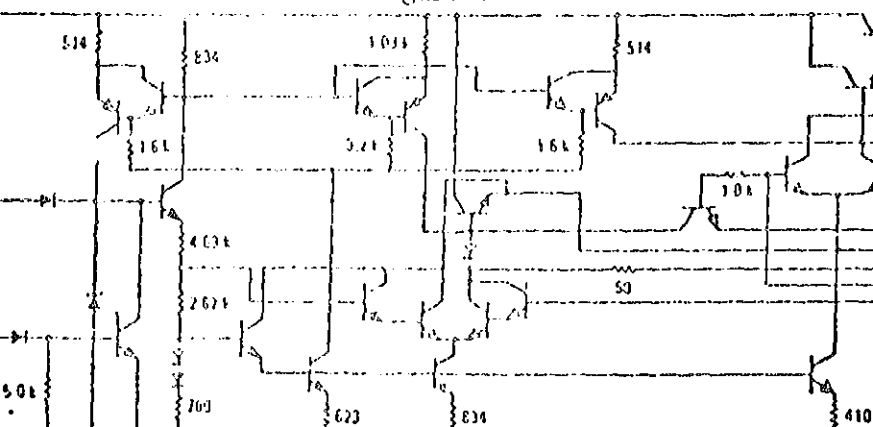
NAND Gate 946 Schematic and Connection Diagra

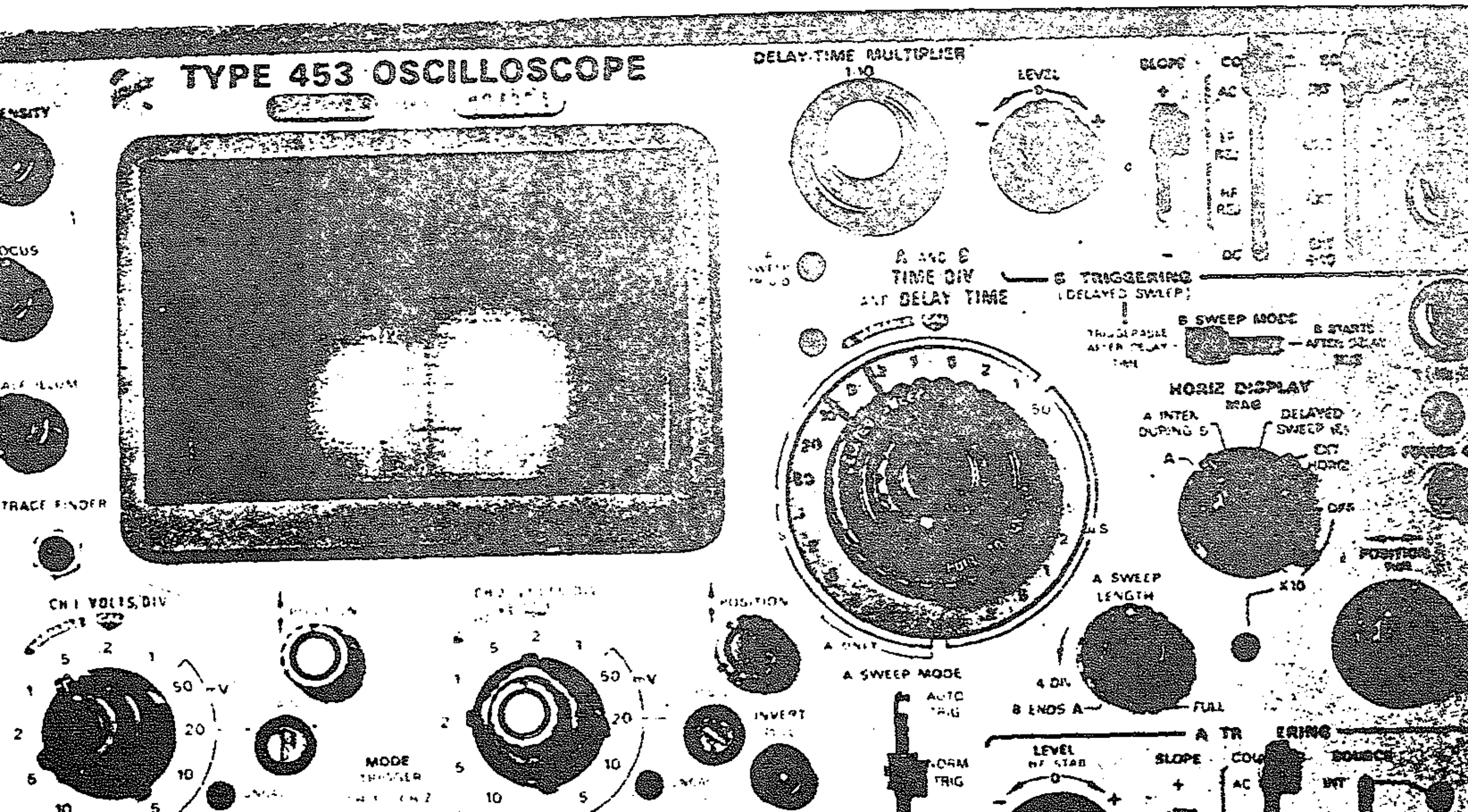
Figure 9

MAXIMUM RATINGS OF MC1560R

Parameter	Symbol	Value
oltage	V_{in}	35
rrent	I_L	600
, pin 2	$I_{pin\ 2}$	10
, pin 9	$I_{pin\ 9}$	5.0
issipation and thermal eristics		
25°C	P_D	3.0
te above T_A = 25°C	$1/\theta_{JA}$	24
mal resistance, junction to air	θ_{JA}	41.6
25°C	P_D	17.5
te above T_C = 25°C	$1/\theta_{JC}$	140
mal resistance, junction to case	θ_{JC}	7.15
ng and storage junction erature range	T_J, T_{stg}	-65 to +150

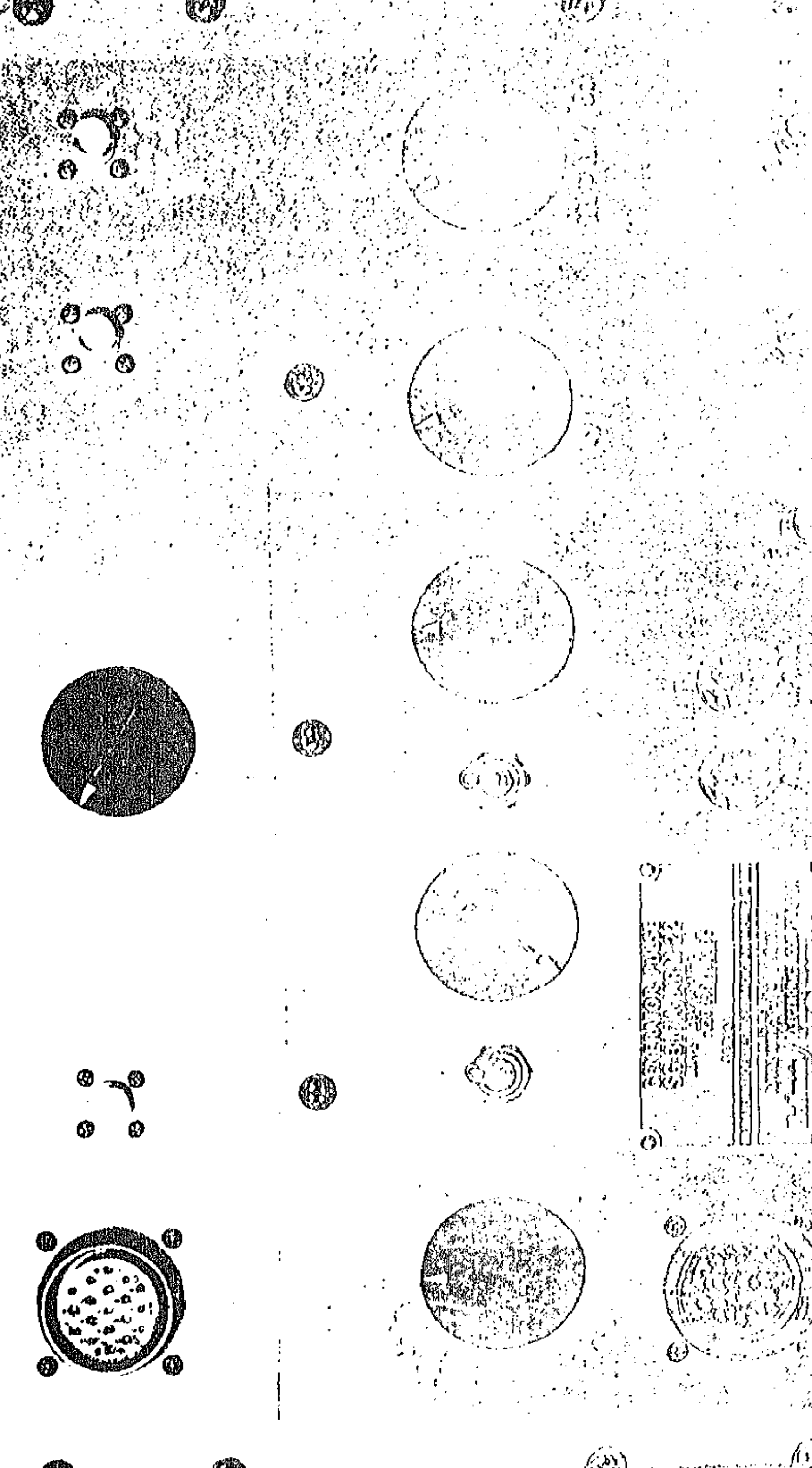
Figure 10




TYPE 453 OSCILLOSCOPE
DELAY-TIME MULTIPLIER
LEVEL
SLOPE
AC
DC
A AND B
TIME DIV
DELAY TIME
B TRIGGERING
(DELAYED SWEEP)
B SWEEP MODE
B STARTS
HORIZ DISPLAY
MAG
A INTEN
DURING B
DELAYED
SWEEP
A
OFF
X10
A SWEEP
LENGTH
4 DIV
B ENDS A
FULL
A SWEEP MODE
AUTO
NORM
TRIG
LEVEL
SLOPE
AC
INT
FOCUS
TRACE FINDER
CH 1 VOLTS/DIV
50
20
10
V
mV
MODE
TRIGGER
POSITION
INVERT

GENERATOR SIGNAL
SG 5
ARM 122

FIXED RANGE



TEST SET, RADIO
AN/ARM-22A

NAVAL AIR SYSTEMS COMMAND

BLOCK DIAGRAM ANALYSIS

wer the following questions.

The RF module is composed of what sections?

a. _____

b. _____

c. _____

d. _____

e. _____

The Antenna Selector module performs what function/s
a. Allows the use of one antenna for receive and tr
b. Selects the proper antenna for receive and trans
c. Allows the use of two antennas for air-to-air op
d. Selects the antenna with the first usable signal

One of the purposes of the 4045.7 Hz oscillator in t
a. provide fine range accuracy.
b. provide coarse range accuracy.
c. provide fine azimuth accuracy.
d. provide coarse range and azimuth accuracy.

The purpose of the countdown MVB is to
a. establish the correct PRF.
b. control the correct PRF.
c. generate a pulse at a 22-30 Hz rate in search.
d. generate a pulse at a 120-150 Hz rate in track.

The The d-c voltage from the distance measuring pote
the R,M,M, is controlled by
a. speed of rotation.
b. direction of rotation.
c. the indicated range.
d. the range from the beacon in search.

The gate length of the early gate former and late ga
a. 12 µsec early gate, 12 µsec late gate.
b. 24 µsec early gate, 24 µsec late gate.
c. 24 µsec early gate, 12 µsec late gate.
d. 24 µsec late gate, 12 µsec early gate.

The memory of the range circuits is how long? _____

Eliminates the MRB and ARB's and controls the peak det
Eliminates the North Burst and controls the peak detec
Ensures that the North Burst and the ARB's are not rem
from the video before detection.
Control the peak detector only when the MRB and ARB's

15 Hz filter and phase adjust
filters out the 15 Hz.
filters the 135 Hz signal out, maintains a constant am
signal out.
filters out the 15 Hz and supplies an unprocessed sign
the 5% level detector and an unprocessed signal to the
filter and phase inverter.
filters out the 135 Hz and supplies an unprocessed sig
the 5% level detector and an unprocessed signal to the
filter and phase inverter.

40° coincidence circuit output will
switch the bearing circuits from 15 Hz track to track.
enable the search control to switch the feedback from
ative to regenerative.
Have a positive 13 volt output in track.
Have a positive 13 volt output in search.

is the purpose of the 5% level detector, and what fun
it perform?

---

135 Hz phase comparator output is applied to the magne
er drivers when

---

15 Hz filter on the 135 Hz filter accomplish what func
Change a sine wave to a square wave.
Change a square wave to a sine wave.
Invert and amplify.
Provide a phase shifted sine wave.

Hz track the indicator is
within a 40° sector at $\pm$ 2/9 of a degree.
rotating maximum CCW.
within a 15° sector.
within or at the correct 40° sector.

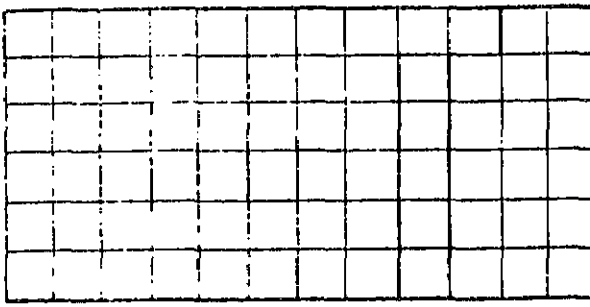
DATA SHEET NO. T5.3.5

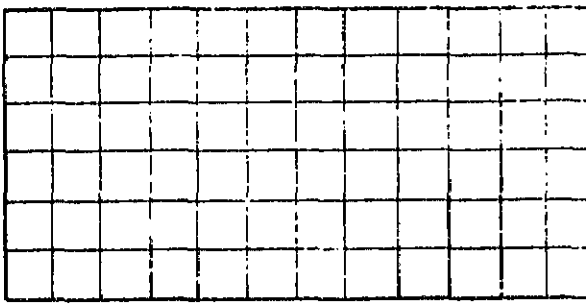
TITLE: RANGE DECODER CIRCUIT ANALYSIS

1. Decoder circuits

a.

(1)





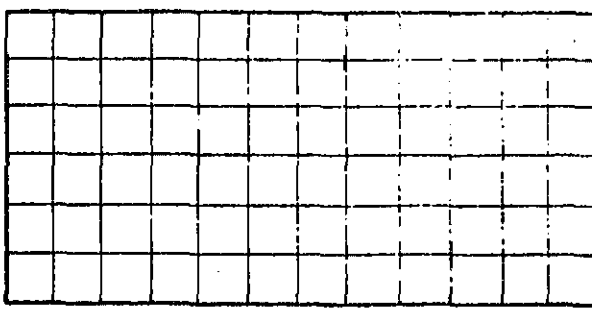
(2)

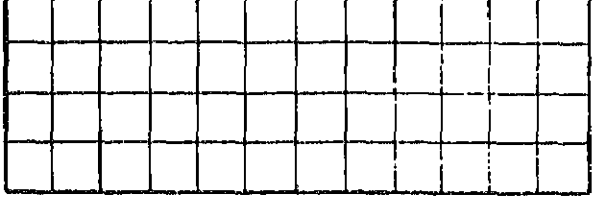
b. Describe the circuit operation which cause the MRB between the two signals observed.

2. Amplifier and limiter section

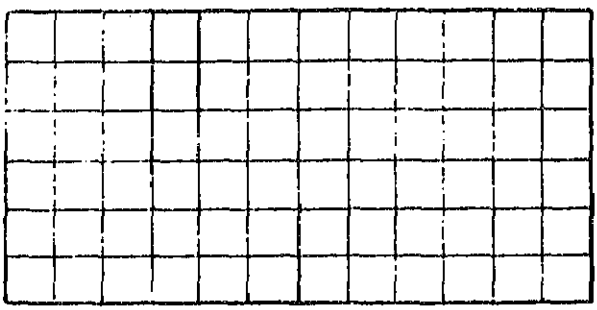
a.

(1)





(3)



. List where these signals are applied and what they for.

(1) _____

(2) _____

(3) _____

AGC circuits

.

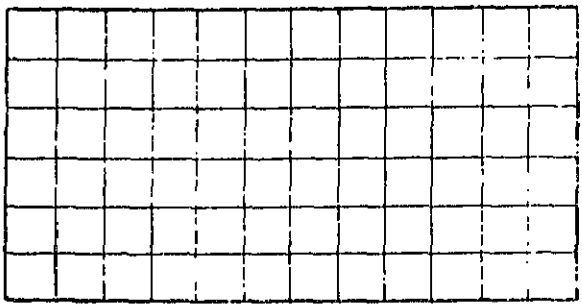
(1) _____ vdc

(2) _____ vdc

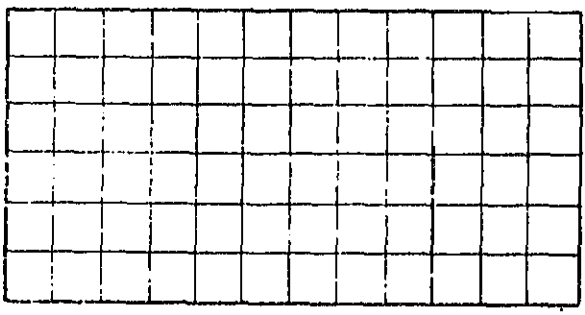
(3) _____ vdc

tone circuits

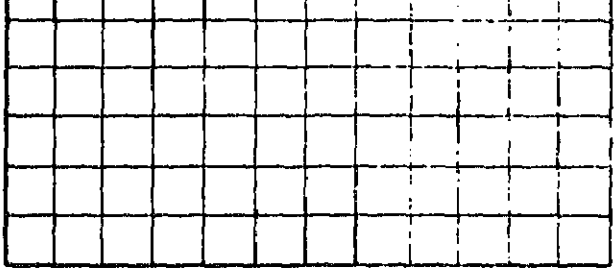
(1)



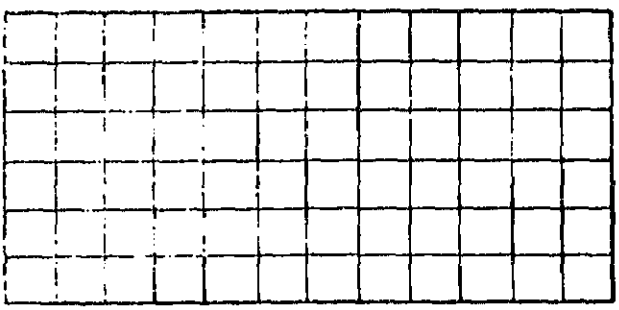
(2)



What caused the difference between the tone and squitte
waveforms at J1 pin 8?



(2)



b.

(1) What caused the difference between the two wa
served? _____

_____

(2) What is the purpose of the signal observed at
of Q9? _____

_____

Answer the following questions:

1. After decoding, the MRB will appear as
   a. 12 pulse pairs spaced 30 μsec apart.
   b. 11 pulses spaced 24 μsec apart.
   c. 12 pulses spaced 24 μsec apart.
   d. 12 pulses spaced 30 μsec apart.

2. After decoding, the ARB will appear as
   a. 12 pulses spaced 24 μsec apart.
   b. 11 pulses spaced 12 μsec apart.
   c. 11 pulses spaced 24 μsec apart.
   d. 12 pulses spaced 12 μsec apart.

3. In the pulse limiter section of the decoder, R29, vide what function?
   a. A 12 μsec delay.
   b. A 11 μsec delay.
   c. A 2 μsec delay.
   d. A phase shift of 90°.

4. The reference voltage of AR2 is changed when in a positive reference; why?
   a. In normal operation, the static output of AR1
   b. In A/A operation the output of AR2 is a stati
   c. In normal operation, the static output of AR1
   d. In A/A operation, the input signal is referer

5. At J1-13 (1A1A1) with no ID tone being received, ringing is present. Why?
   a. The ARB's and MRB's are sub-harmonics of 135(
   b. R36 is unadjusted.
   c. Abnormal operation.
   d. Relay K2 is energized.

6. AR6 accomplishes what function?
   a. Inverter
   b. Comparator
   c. Voltage follower
   d. Operational amplifier

7. The voltages on pin 5 of AR6 are limited by what'
   a. R63, CR12, and CR13.
   b. R62, R63, and CR12.
   c. R61, R63, R60, CR12, and CR13.
   d. R61, R63, R62, CR12, and CR13.

Range Interrogations.

DATA SHEET NO. T5.3.6

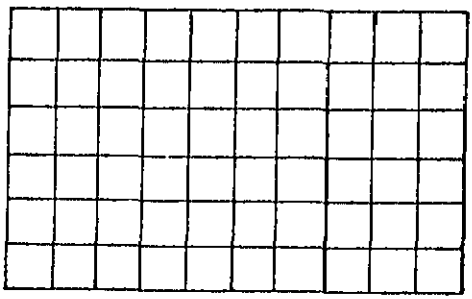
TITLE: RANGE "A" MODULE ANALYSIS

1. Countdown multivibrator circuits

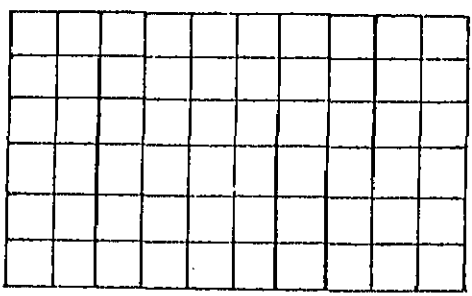
a. Pulse former AR1

(1)

(a)



(b)



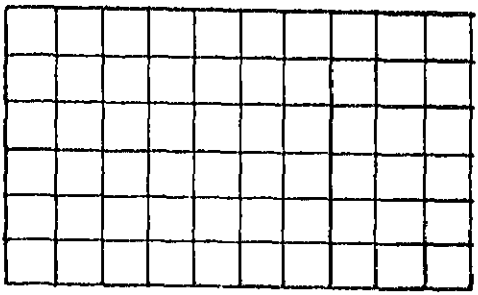
(2) What is the purpose of the signal observed at t

_____

_____

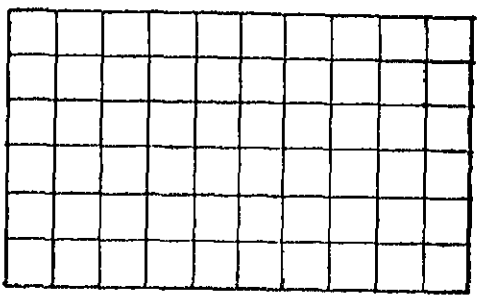
)

(a)



Pin
AR2
RAM

(b)



J1-1
RAM

)

(a) State the purpose of the astable timing oscillator.

_____

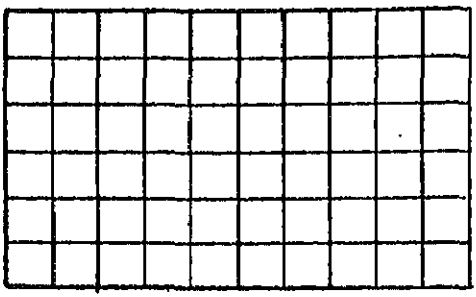
_____

(b) What caused the difference in the signal at the outp
when the equipment switched from search to track?

_____

_____

(a)



PIN 10
AR3
RAM

(b) _____vdc Pin 5 AR3 (Q1 removed)

(a) The change in voltage at pin 5 of AR3 simulates what

_____

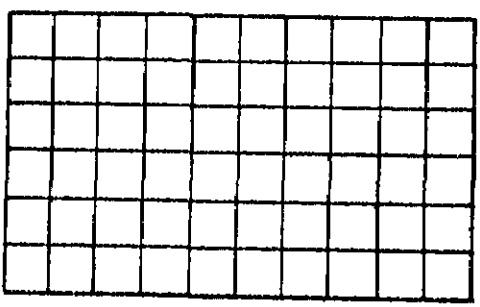
(b) What is the purpose of this change?

_____

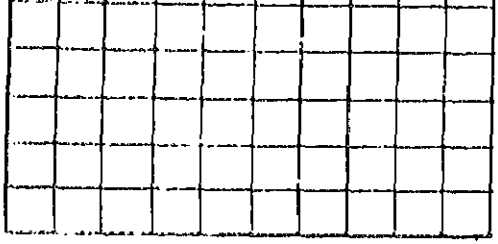
_____

gger Q2

(a)



Junctio
R23 & R
RAM



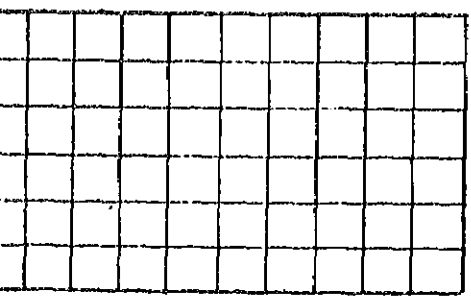
J1-2
RAM

Vhat portion of the astable timing oscillator output trig
this signal?

_____

nge gate circuits

-flop (UB2 NAND Gate)

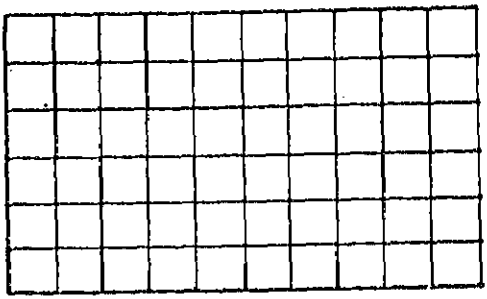


Pin 5
U2B
RAM

hat is the purpose of the flip-flop? _____

_____

_____



(2)

(a) What is the output of AR4 used for? _____

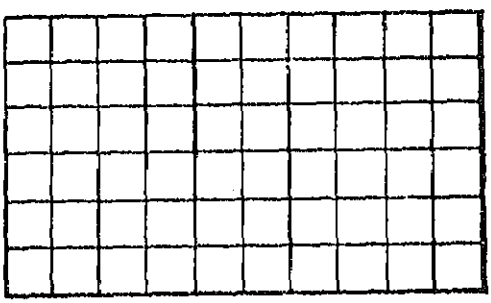
_____

(b) _____

_____

c. Integrator AR5

(1)

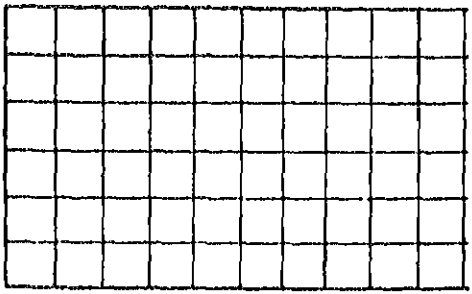


(2)

(a) What is the purpose of Q3 in the integrator

_____

(b) What is the purpose of the output from AR5?

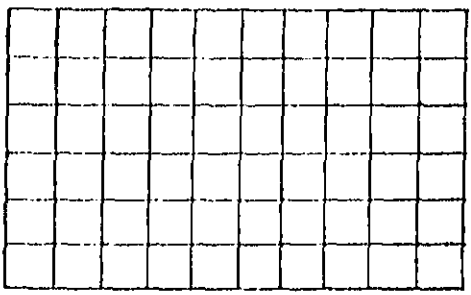


J1-6
RAM

st the two purposes of AR6's output. _____

_____

c One Shot AR7



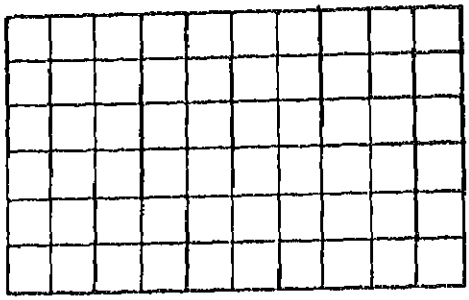
J1-9
RAM

t is the purpose of this signal? _____

_____

a. Fine Range Pulse Amplifier AR8

(1)



Pin
AR8
RAM

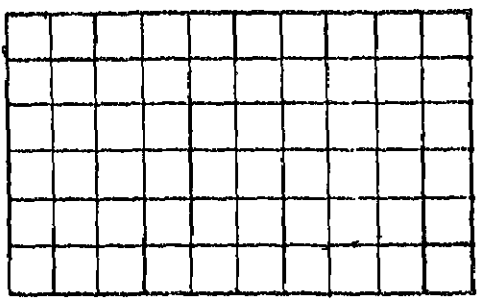
(2) Describe the operation which causes the differer
waveforms observed? _____

_____

_____

b. Fine Range Pulse Generator AR9's Input to U2C

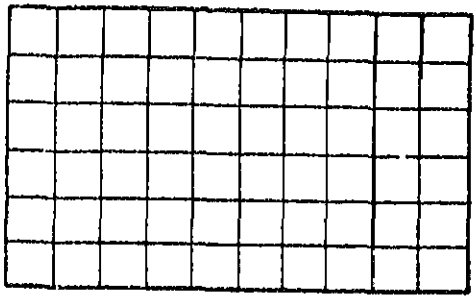
(1)



J1-
RAM

(2) What is the purpose of this signal? _____

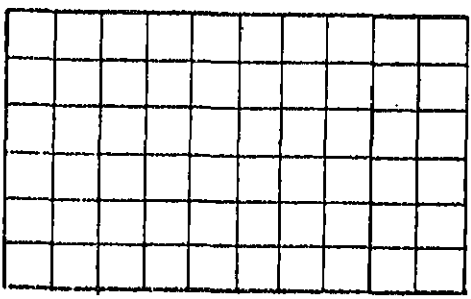
_____



J1-9
RAM

Output Selector Nand Gate U2C

(1)



Pin 8
U2C
RAM

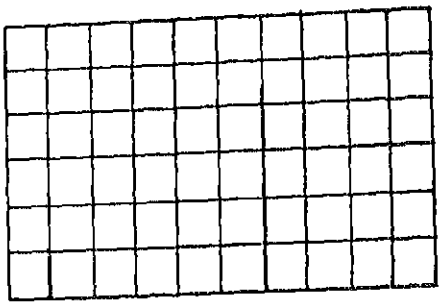
(2) Assuming the equipment is in a search mode, what woul
occurring at the output of the NAND gate?

_____

_____

a. Fine Range Pulse Amplifier AR8

(1)



Pin
AR8
RAM

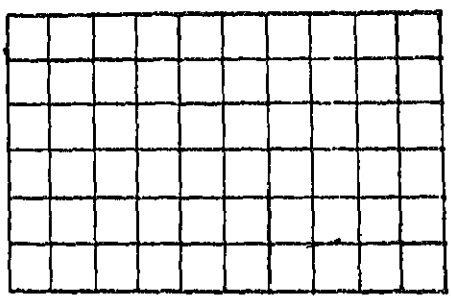
(2) Describe the operation which causes the differen
waveforms observed? _____

_____

_____

b. Fine Range Pulse Generator AR9's Input to U2C

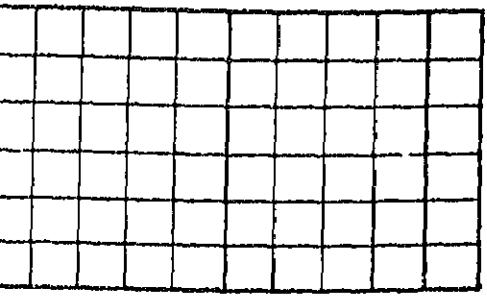
(1)



J1-
RAM

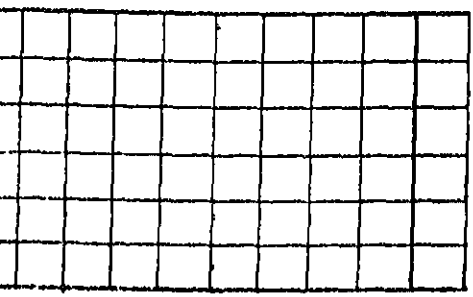
(2) What is the purpose of this signal? _____

_____



J1-9
RAM

put Selector Nand Gate U2C

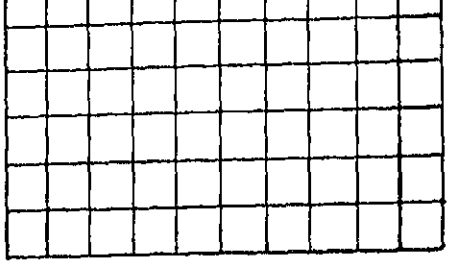


Pin 8
U2C
RAM

Assuming the equipment is in a search mode, what woul
occurring at the output of the NAND gate?

_____

_____



J1
RA

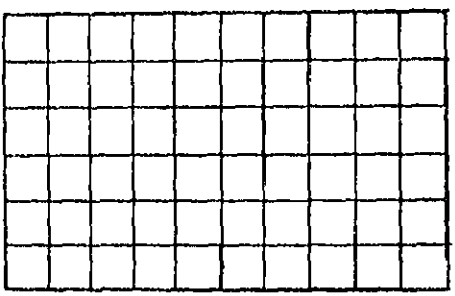
(2) What is the purpose of the output from AR10?

_____

_____

b. Early Gate Former AR11

(1)



J1-1
RAM

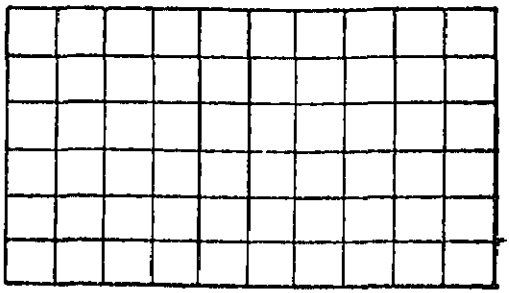
(2) What determines the duration of the output? _

_____

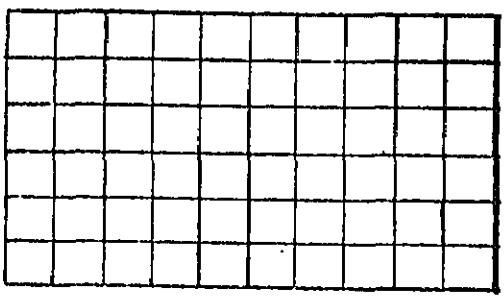
Reply Pulse Multivibrator AR12

a.

(1)



(2)

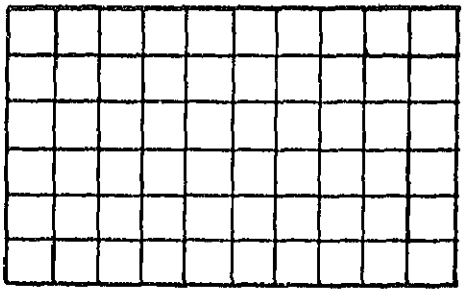


b. Where is the output from AR12 applied? _____

_____

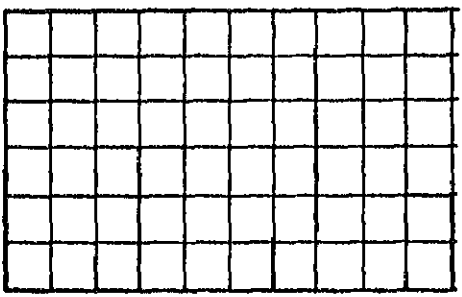
_____

(1)



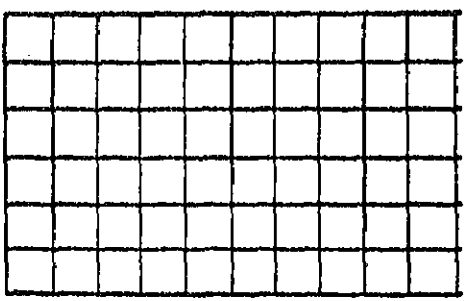
Pin
U1A
RAM

(2)

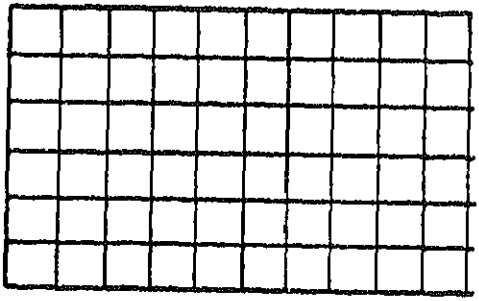


J1-
RAM

(3)

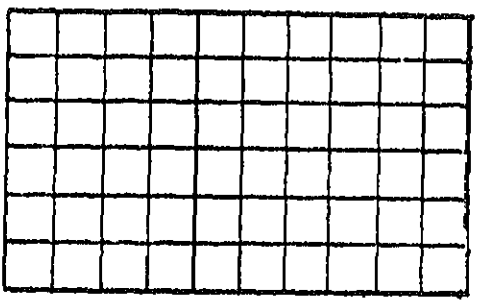


Pin
U1D
RAM



Pin 13
U2D
RAM

(5)



J1-15
RAM

(1) What circuit prevents a late coincidence output durin coincidence time?

_____

_____

(2) Describe the operation of the coincicence circuits?

_____

_____

_____

e following questions:

n 5 of AR2, what signals could be observed? _____

_____

d C2 are connected in parallel with C3 in the _____

d R12 function as a _____ Why? _____

_____

statically _____ and will be _____ when a transmi
ing pulse is received.

unctions as a _____

of U2B is statically
13 volts.
13 volts.
5 volts.
5 volts.

unctions as a _____

in why the output of AR6 is only a negative spike?

_____

_____

utput of the 190 μsec single shot is the _____

pin 9 of U2C goes _____ and pin 10 goes _____ the outp
ill be a negative spike whose length is the same as
_____.

in why the output of AR2 is constantly moving or chang

_____

_____

nput to AR8 will be phase shifted 18° for every _____
of indicator rotation.

From _____

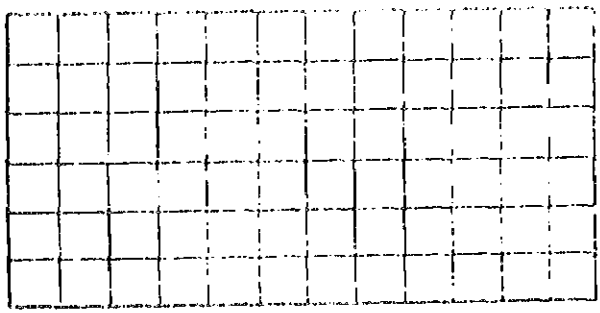
_____

Describe the characteristics and purpose of the signal
pin 2 of J1.

Late coincidence circuits

a.

(1)



(2) _____ vdc

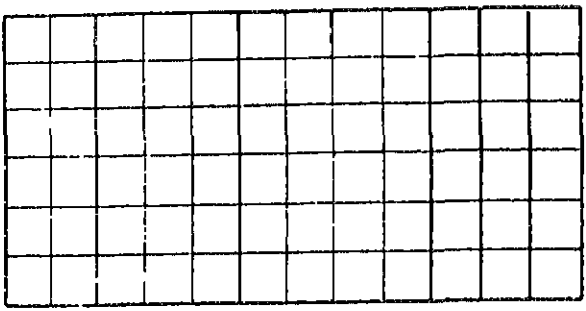
(3) _____ vdc

b. What is the function of the late coincidence circui
search and track?

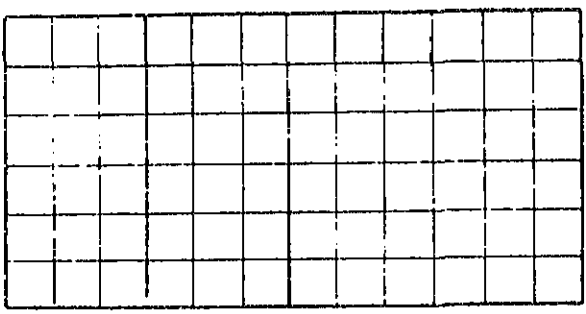
_____

_____

(1)



(2)



(3) _____ vdc

(4) _____ vdc

b.

(1) What is the purpose of the track AND Gate? _____

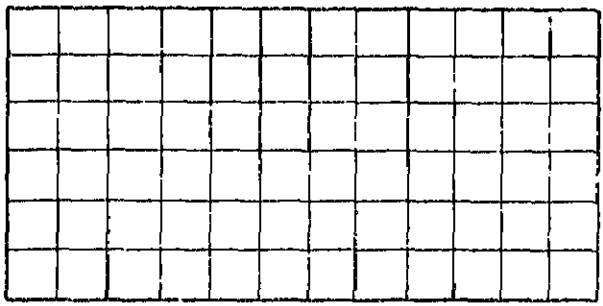
_____

_____

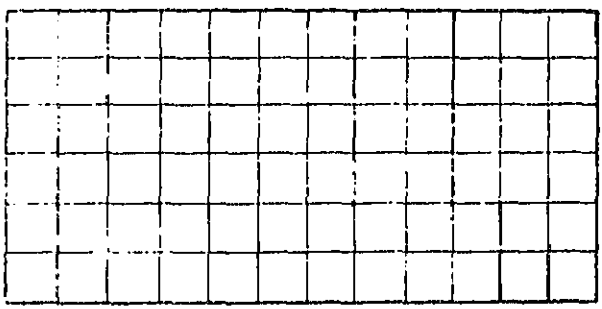
the operation of the range indicator.

arly and late coincidence amplifiers

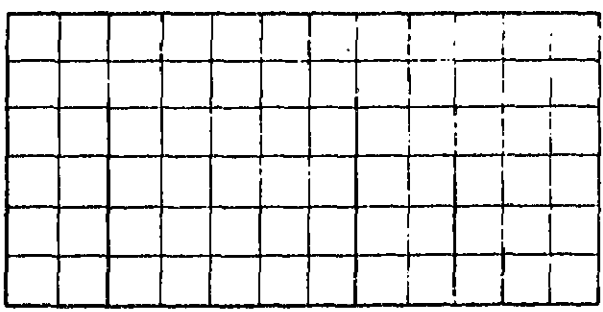
(1)

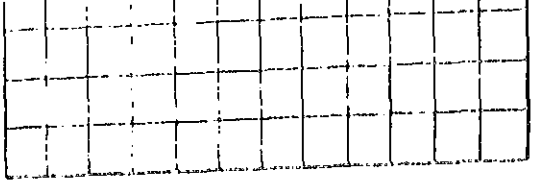


(2)



(3)





(5) _____ vdc

(6) _____ vdc

b.

(1) What determines the charge on C5 and C6 in trac

_____

(2) Explain the voltages observed on C5 and C6 whil equipment was tracking in range rate.

_____

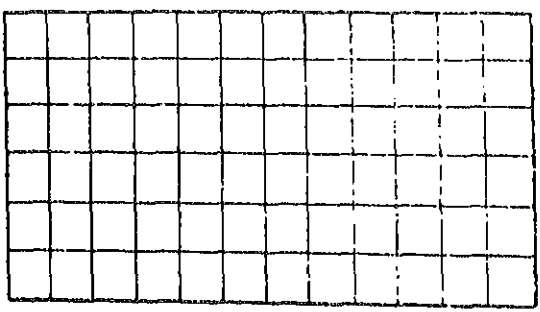
_____

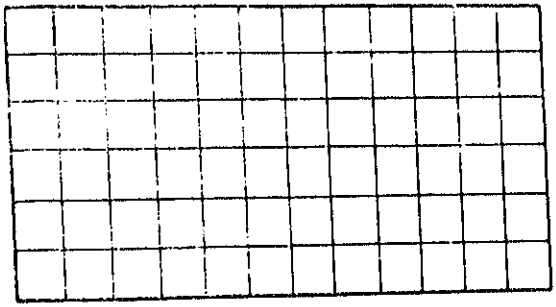
_____

4. Magnetic amplifier control circuits

a.

(1)





b. What is the purpose of these signals? _____

_____

5. Memory circuits

a.

(1) _____ vdc

(2) _____ vdc

(3) _____ vdc

(4) _____ vdc

b.

(1) What is the memory time of AR7? _____

(2) When does the output from AR8 occur?

_____

_____

Answer the following questions:

1. Explain why the MAG AMP control circuits are
to count out at a maximum speed in the searc

_____

_____

2. What relay provides the countdown ground to
energized?

_____

3. When K2 is deenergized the range circuits sw
to _____.

4. A _____ signal will be present at P2-
_____.

5. What is the purpose of the signal referred t

_____

6. Which mag amp drive drives the indicator fro
miles? _____

7. What is the condition of the control relays
mode?

_____

8. What is necessary to cause the RBM to switch
to the track mode of operation _____

9. If the early coincidence pulse was wider tha
[illegible] the RBM, the charge on C5 would b
[illegible]uld be _____.

ts have a memory of _____
_____.

11. When will the charge on C5 and C6 be equal?

12. What is the purpose of the RBM? _____

_____

the following questions:

t type of circuits are the input circuits to AR1 and A

_____

_____ is the memory capacitor for the ASM.

n the ASM is in the search mode of operation AR3's out
_____ volts.

astable MVB has a switching time of _____ whic
table by _____.

identification signal is transmitted from the ground
y _____.

memory time of the ASM is _____.

does the ASM not go into the search mode of operation
tification signals?

_____

ain how the ASM is switched from the search to the tr
peration.

_____

_____

he track mode of operation, what would be seen at J1-

_____

2. POWER SUPPLY

Answer the following questions:

1. What is the purpose of CR807? _____

_____

2. R803 has no current flow when _____

3. CR808 is used for what purpose? _____

_____

4. Q814, R833, and CR823 provide _____

5. Briefly explain how T802 and associated circuits c
change in input voltage.

_____

_____

_____

_____

6. 60 seconds after power is applied _____ vdc will
TP-803 and _____ seconds later _____ voltage wi

7. What would cause an increased voltage drop across C

_____

_____

. Q803, Q804, Q805, and Q806 are connected as what? E

_____

_____

_____

26 vac is defective, a possible problem is _____

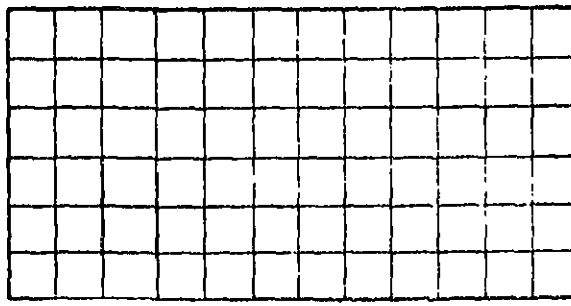
_____

LE: BEARING DECODER MODULE ANALYSIS

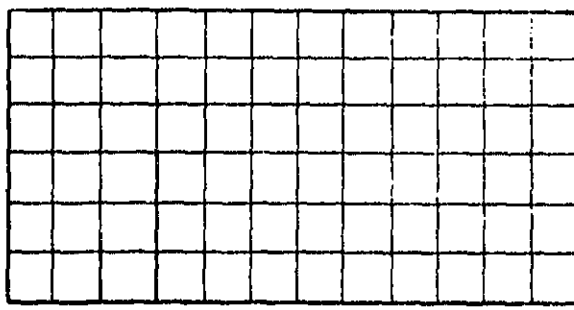
1. Detection of amplitude modulated video

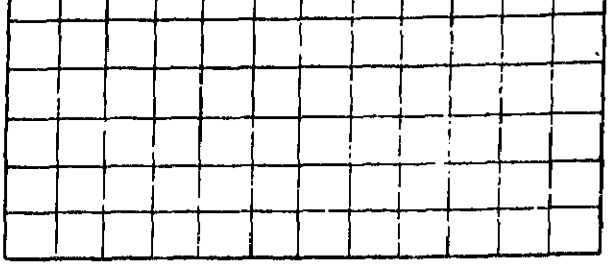
a.

(1)



(2)





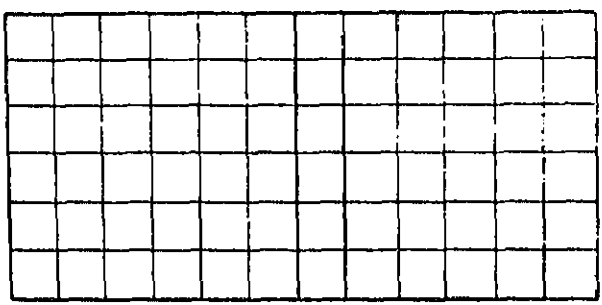
When is Q1 cut off? _____

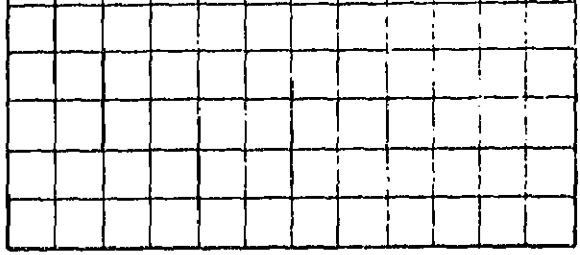
_____

When is Q2 cut on? _____

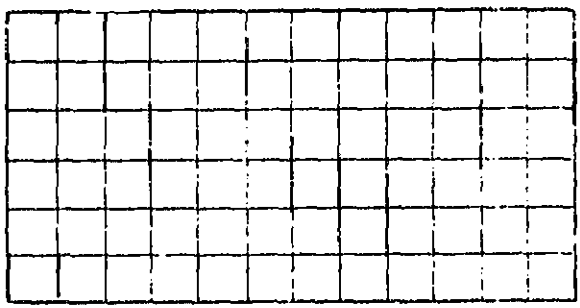
_____

urst detection

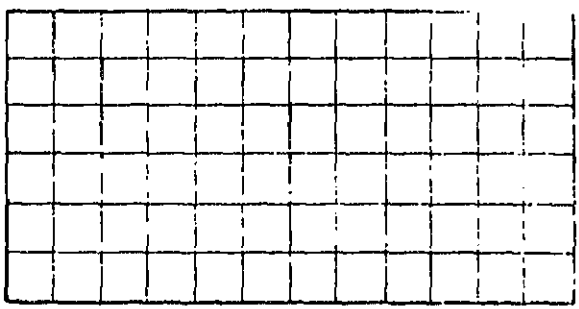




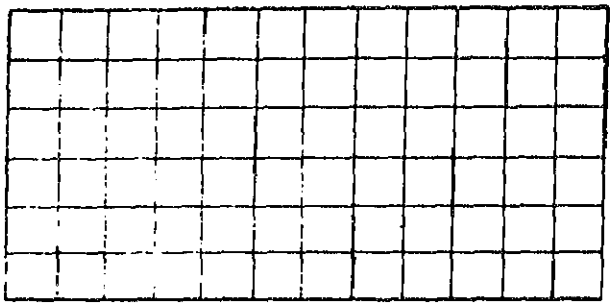
(3)



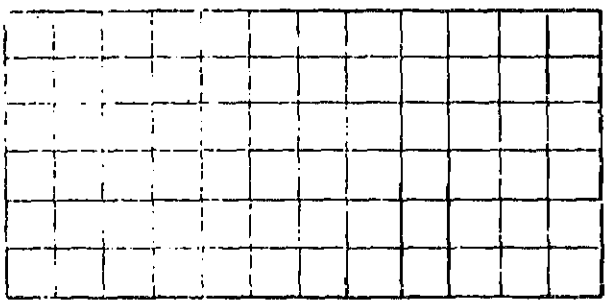
(4)



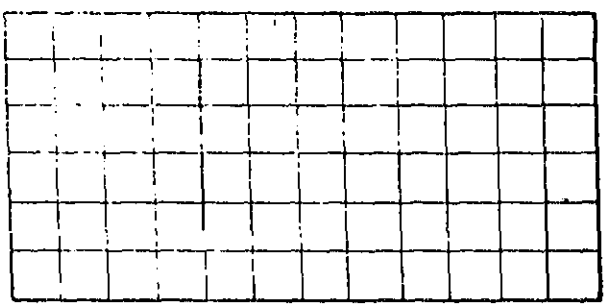
(6)



(7)



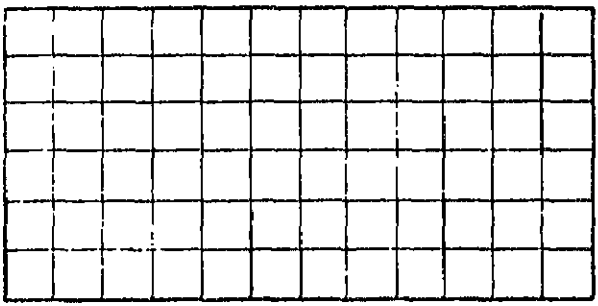
(8)



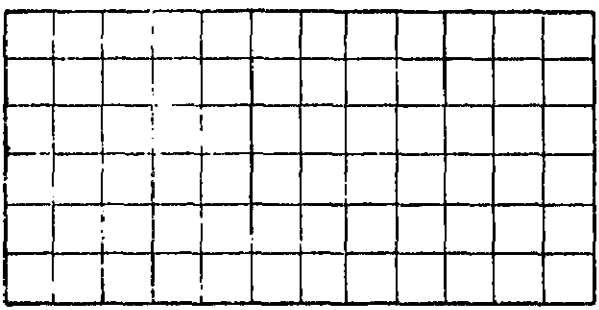
(2) Explain the purpose of the 15 Hz ringing burst.

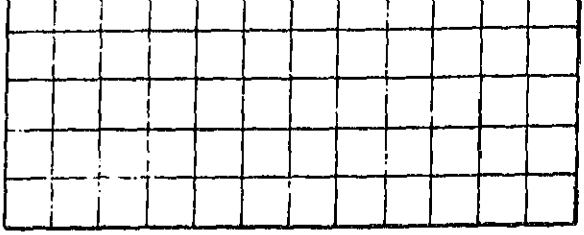
iliary Burst detection

(1)

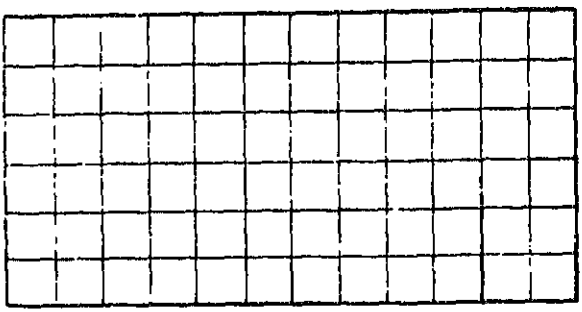


(2)





(4)



b.

(1) What frequency is the tank circuit L1, R26, ar
to?

_____

_____

(2) Explain the purpose of the input from AR4 to
multivibrator.

_____

_____

b.

(1) Explain the purpose of the input to pin 5 of AR

_____

_____

(2) Explain the purpose of the 15 Hz ringing burst.

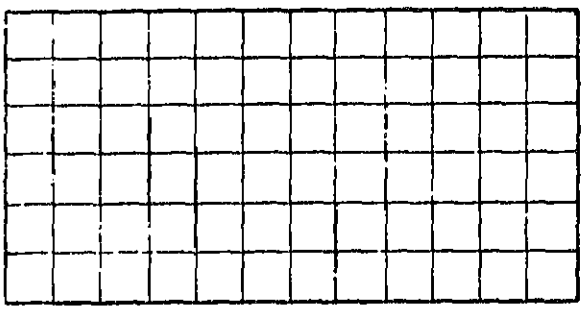
_____

_____

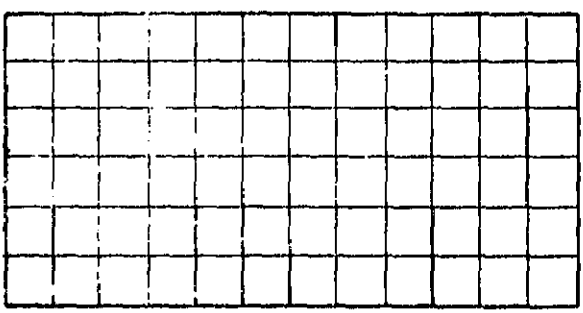
Auxiliary Burst detection

a.

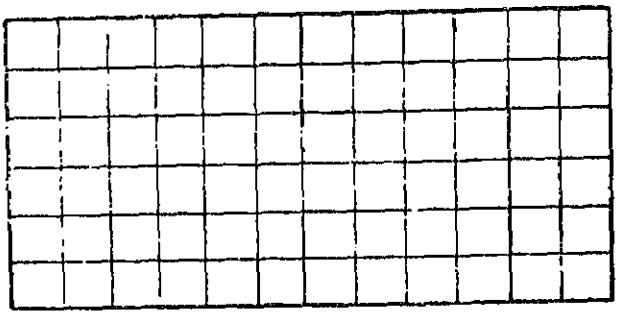
(1)



(2)



(4)



b.

(1) What frequency is the tank circuit L1, R26, a
to?

_____

_____

(2) Explain the purpose of the input from AR4 to
multivibrator.

_____

_____

Answer the following questions:

1. The output of AR5, the AUX BURST IDENTIFIER is
   a. an 83.3 kHz sine wave.
   b. 11 pulses, 12 µsec apart.
   c. 8 pulses for every antenna revolution.
   d. 9 pulses for every antenna revolution.

2. The input to Q12, the AUX BURST DETECTOR is
   a. 11 pulses, 12 µsec apart.
   b. 12 pulses, 12 µsec apart.
   c. 12 pulses, 30 µsec apart.
   d. Delayed negative limited video.

3. The static condition of Q1 and Q2 is
   a. Q1 and Q2 both on.
   b. Q1 and Q2 both off.
   c. Q1 off and Q2 on.
   d. Q1 on and Q2 off.

4. The purpose of sending the AR4 output to Q14 is
   a. to disable the 135 Hz reference MVB during the ti
      Burst.
   b. sync the 135 Hz reference MVB to the 15 Hz refere
   c. trigger the 15 Hz reference MVB during the time c
   d. to qualify the AND gate made up by CR15 and CR16.

5. Describe the operation and purpose of the Burst Elimi

6. Briefly describe the operation of the North Burst De

7. What is the purpose of the BDM?

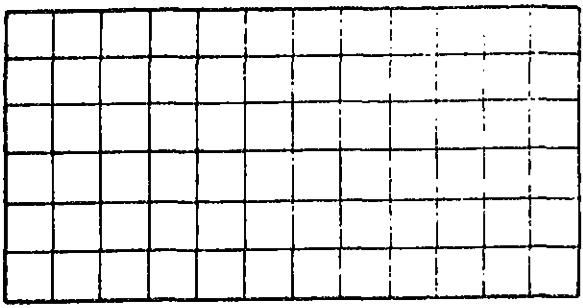
8. What is the purpose of Q5?

9. If the modulation of the 15 Hz signal drops below 5%
   of AR3 will be _____

LE: BEARING "A" AND "B" MODULE ANALYSIS

1. 15 Hz Filter and Phase adjust.

   a.

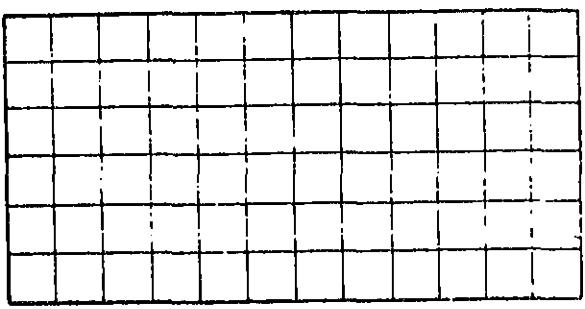


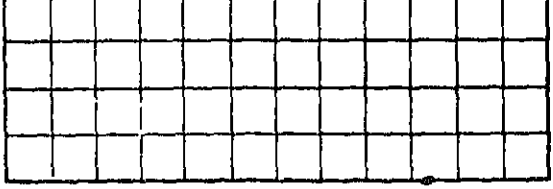
   b. Where will the output of the 15 Hz filter and applied, and what will it be used for?

2. 15 Hz Filter and Phase Inverter

   a.

   (1)





b. What is the purpose of the 15 Hz filter and phase inv

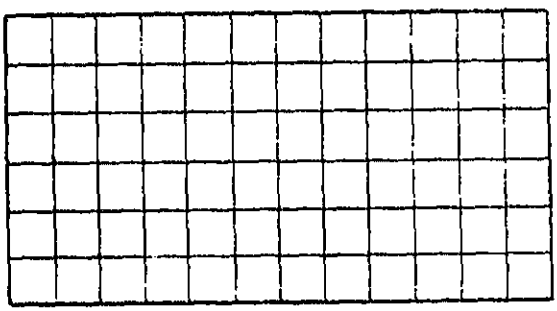
_____

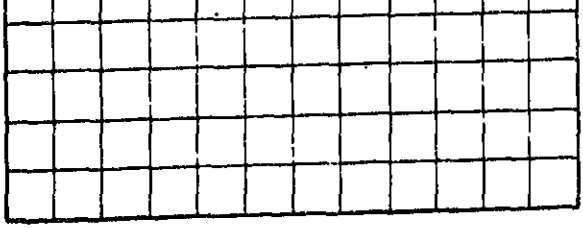
_____

40° Gate Generator

a.

(1)





b. Describe each of the waveforms observed.

(1) _____

(2) _____

. 40° Coincidence

a.

(1) _____ vdc

(2) _____ vdc

b. What is the purpose of the 40° coincidence circu

_____

_____

. Search Control

a.

(1) Track _____ vdc

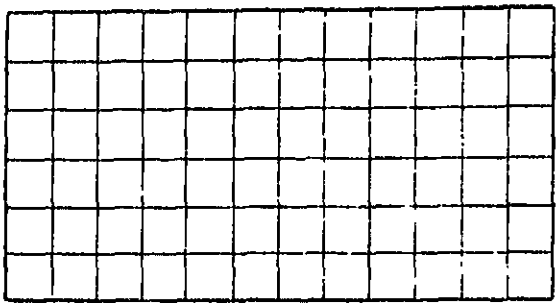
(2) Search _____ vdc

b. What is the purpose of the search control?

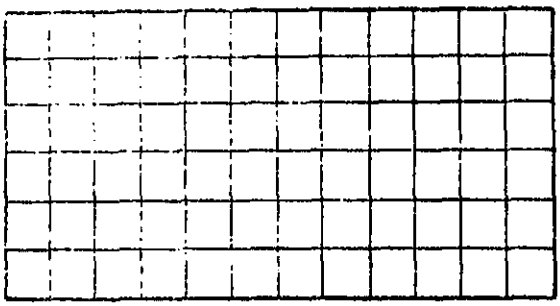
_____

a.

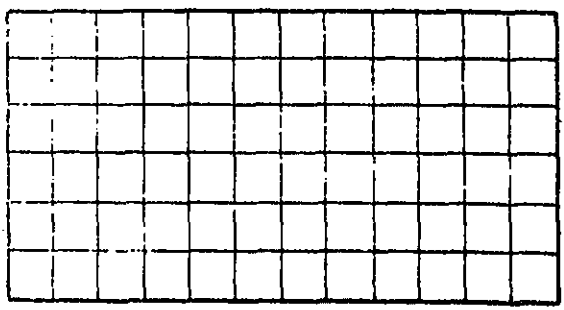
(1)



(2)



(3)



6.

(1) Explain the use of the 15 Hz phase compara

_____

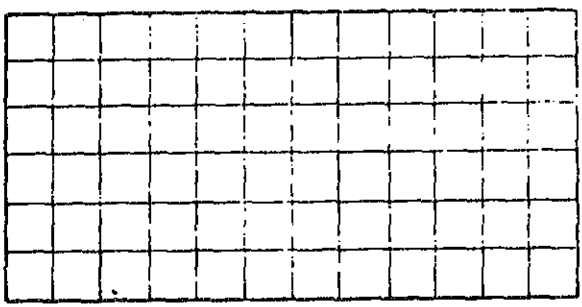
_____

(2) Where will the 15 Hz comparator output be

_____

7. 135 Hz Filter and Phase adjust

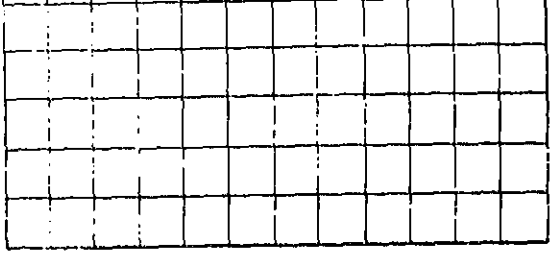
a.



b. Where will the output be applied and what will

_____

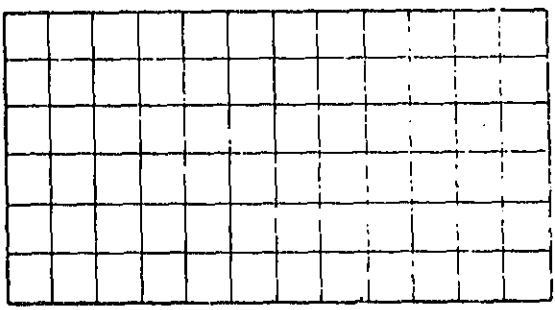
_____



b. Where and for what reason is the output of the 135 H
Q5 applied?

135 Hz Summing Amplifier

a.



b. What is the purpose of applying the phase shifted 13
the reliability amplifier?

(2) _____ DC CR11 (Search)

(3) _____ DC CR12 (Track)

(4) _____ DC CR12 (Search)

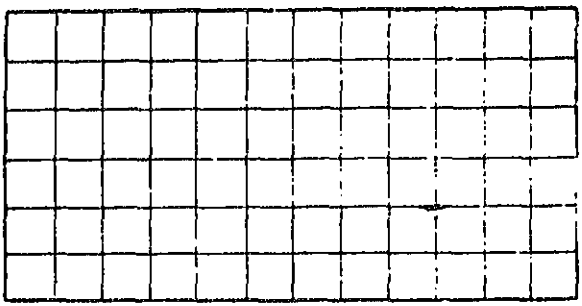
b. State the purpose of the AND gate. _____

_____

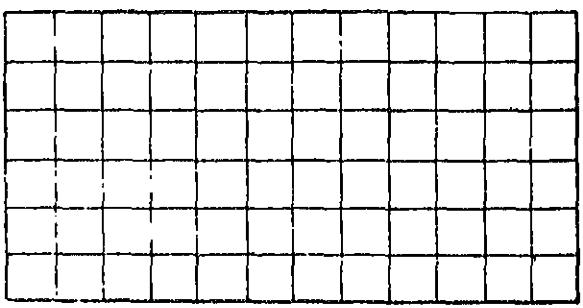
11. 135 Hz Phase Comparators

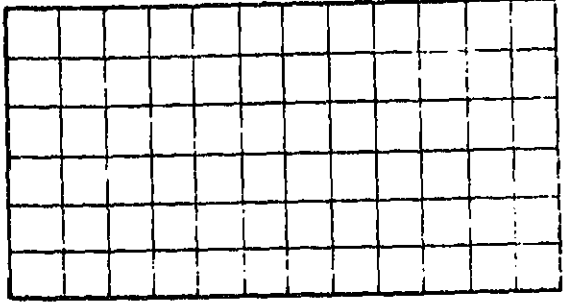
a.

(1)



(2)





(4) _____ vdc

(5) _____ vdc

(6) _____ vdc

(7) _____ vdc

State the purpose of the 135 Hz comparators.

_____

_____

_____

ING A AND B MODULE ANALYSIS

ne following questions:

fly explain the purpose of the BAM and BBM.

_____

_____

_____

35 Hz resolver phase shifts the 135 Hz reference signal
every _____ degrees of rotation of the bearing motor.

utput from the 40° coincidence circuit in the BBM would
? _____

eference to the 135 Hz Phase Comparator, when C4 is more
in respect to C5 , he indicator will _____

_____

fly explain why the indicator will turn at a maximum spe
no input to the search control circuits.

_____

_____

_____

_____

ere is a good signal present at both CR11 and CR12 in t
acan will switch from _____ to _____.

asic circuit configuration of the MAG AMP drivers in th

_____

search condition, the TACH feedback from the BMM to the
_____ because K1 is _____.

ignal seen at pin 8 of J1 in the BBM is
400 µsec gate.
5 Hz square wave.
135 Hz square wave.
50 millisecond gate.

. The discharge time of the memory capacitor, in the BBM _____ during 15 Hz track because K2 is ___

. What is the purpose of 1A1A6 Q5? _____ _____

_____

_____

. The output of AR7 is sent to three different stages. I stages and the effect that AR7's output has on each.

_____ . _____

_____ . _____

_____ . _____

. When tracking a changing azimuth, the _____ ou the BAM would be constantly _____

. When the Tacan is locked on to a fixed bearing, the two present at pin 4 of AR2 would be _____ degrees out of and the two signals present at pin 4 of AR4 would be __ degrees out of phase.

. The output of AR13 in the BAM is a _____ Hz _____.

. The signal present at 1A1A6 J1-4 is a _____Hz _____.

. In reference to the 135 Hz reliability, what is the pur and CR6? _____

_____

TITLE: TACAN TROUBLESHOOTING

Answer the following questions:

1. Tacan receiver sensitivity is weak. A possible
   a. CR6 open.
   b. Q6 open.
   c. CR11 shorted.
   d. AR7 inoperative.

2. Tacan Range, ID Tone and Bearing defective. A
   (1A1A1)
   a. Q10 shorted.
   b. AR3 defective.
   c. DL1 open.
   d. AR8 inoperative.

3. Air-to-air operation is defective. A possible
   a. R30 open.
   b. R34 open.
   c. P1-P open.
   d. P1-R open.

4. No Tacan range. At J L-2, J1-4, waveforms appea
   points J1-15 and J1-16 are abnormal. A possibl
   a. AR8 defective.
   b. AR1 defective.
   c. U1B defective.
   d. Q3 open.

5. Tacan Range in inaccurate. A possible cause is
   a. R61 misadjusted.
   b. R42 open.
   c. Q1 shorted.
   d. R15 misadjusted.

6. Tacan indicator slows down, but will not lock o
   is (1A1A2)
   a. AR11 defective, no output.
   b. U2C pin 8 open.
   c. U1C pin 8 open.
   d. U2D pin 11 open.

The Antenna Selector Module does not switch at the corre
a search condition. A possible cause is
a. R29 shorted.
b. R34 misadjusted.
c. Q3 shorted.
d. R4 misadjusted.

In the process of troubleshooting, it is noted that none
relays are ever actuated. A possible cause is
a. +120 volt supply.
b. -15 volt supply.
c. 1A1Q1 defective.
d. 1A1A9 defective.

The -108 supply voltage is reading -130 volts. A possib
(1A1A15)
a. CR815 open.
b. Q812 open.
c. CR824 open.
d. R811 open.

(1A1A15) The 6.3 vac line is reading high. A possible
a. R833 open.
b. R832 open.
c. R829 open.
d. R831 open.

Tacan range is bad. Signal at J1-7 is +13 vdc. Test po
normal. A possible trouble is (1A1A2)
a. AR3 defective.
b. U2A pin 2 open.
c. U2C pin 8 open.
d. C5 open.

Range flag on Tacan indicator remains up all the time.
cause is (1A1A3)
a. Q17 open.
b. Q18 shorted.
c. K5 pin 6 open.
d. K2 pin 3 open.

c. K6 pin 7 shorted to ground.
d. R37 open.

Tacan range indicator stops at the proper range, but
remains in the window. A possible cause is (1A1A3)
a. Q10 shorted.
b. Q17 open.
c. Q14 open.
d. Q13 open.

No bearing, indicator searches counterclockwise. A p
is (1A1A4).
a. R17 open.
b. C18 open.
c. CR7 open.
d. CR16 open.

Indicator shows a 7° error. A possible cause is
a. 1A1A5 R31 open.
b. 1A1A6 R40 open.
c. 1A1A6 R19 open.
d. 1A1A4 R7 open.

Bearing indicator continuously searches. A possible
a. 1A1A4 CR15 open.
b. 1A1A5 CR7 shorted.
c. 1A1A5 C16 shorted.
d. 1A1A6 AR8 bad.

Bearing indicator is 4° in error. A possible cause is
a. 1A1A6 C15 shorted.
b. 1A1A6 AR1 bad.
c. 1A1A4 CR13 open.
d. 1A1A5 AR13 bad.

Bearing indicator will not lock on. A possible troubl
a. 1A1A4 Q14 open.
b. 1A1A6 Q5 open.
c. 1A1A5 Q2 open.
d. 1A1A1 Q10 open.

MODULE ANALYSIS

the following questions:

efly explain the purpose of the RF Module. _____

_____

_____

_____

t the five sections of the RF Module.

_____ Series _____

_____ Series _____

_____ Series _____

_____ Series _____

_____ Series _____

t the sections of the RF Module that are mechanically tune

_____

_____

n is 1800 vdc applied to the RF amplifiers? _____

lain the purpose of the preselectors _____

_____

n will the frequency multipliers be disabled? _____

_____

what reason is double conversion used in the IF's? _____

_____

lain the use of the deblocking circuit. _____

_____

uit?

is the purpose of the 1 μsec delays in the modulator?

determines when the A/A storage counter will trigger?

the four inputs to the base of Q1523 and where they can

is the purpose of the initial inhibiting circuit?

he trailing edge of the 25 μsec suppression pulse a 170
is developed. What is this gate used for, and where is
ed?

ain how the receiver is blanked when transmitting.

ain why the A/A priority circuit is used.

Answer the following questions:

1. Q4 will be triggered _____ μsec after an input appe
   the _____ edge of the _____ μsec gate out of Q2.

2. When will CR8 be forward biased? _____

3. When will CR7 be forward biased? _____

4. Briefly explain the operation of the circuitry contro

5. When Q3 is off, CR1 will be _____ and Q4 will _____

6. During the A/A mode of operation, which of the follow
   are present?
   a. K2, K3, K4, and K5 are all energized.
   b. K2, K4, and K5 are energized, K3 is deenergized.
   c. K4 and K5 energized, K2 and K3 are deenergized.
   d. K2 deenergized, K3, K4, and K5 energized.

7. List the outputs of the AAM, where they go, and their

8. What is the purpose of R13? _____

THE UNITED STATES NAVY

GUARDIAN OF OUR COUNTRY

The United States Navy is responsible for maintaining control of the s
and is a ready force on watch at home and overseas, capable of stro
action to preserve the peace or of instant offensive action to win in w

It is upon the maintenance of this control that our country's glorio
future depends; the United States Navy exists to make it so.

WE SERVE WITH HONOR

Tradition, valor, and victory are the Navy's heritage from the past.
these may be added dedication, discipline, and vigilance as the watchwor
of the present and the future.

At home or on distant stations we serve with pride, confident in the respe
of our country, our shipmates, and our families.

Our responsibilities sober us; our adversities strengthen us.

Service to God and Country is our special privilege. We serve with hon

THE FUTURE OF THE NAVY

The Navy will always employ new weapons, new techniques, a
greater power to protect and defend the United States on the sea, und
the sea, and in the air.

Now and in the future, control of the sea gives the United States h
greatest advantage for the maintenance of peace and for victory in wa

Mobility, surprise, dispersal, and offensive power are the keynotes
the new Navy. The roots of the Navy lie in a strong belief in t
uture, in continued dedication to our tasks, and in reflection on o
eritage from the past.

Never have our opportunities and our responsibilities been greate

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